

POPULAR SCIENCE

MONTHLY
MECHANICS AND HANDICRAFT

May 25¢

America's Fastest Liner
PAGE 3



**How
Belanger
Builds
Winners** PAGE 88

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This Month's Big Features:



His face deeply creased from tight-fitting headgear, this frogman is ready to risk his life on an Underwater Demolition Team in daring shoreline raids. For a vivid account of a frogman's toughening-up process, see page 135.

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NEXT MONTH . . .

What to Do About Shocks



If your car bounds off the high spots like a five-year-old on a Pogo stick, those mud-encrusted gadgets commonly called shocks are probably to blame. Next month a fact-packed article will explain how they work and what you can do about it when they don't.



Up to the top . . . together



If you've ever asked yourself "What can I do to get ahead?" you'll find the story of Ernest and Janet Jarvis interesting and inspiring

They married young. Neither had finished grammar school. Both worked—and studied.

Ernest was enrolled with the International Correspondence Schools. Janet helped him with his lessons. Together they mastered Chemistry, Metallurgy and other I. C. S. subjects.

Slowly, surely, their training bore fruit. Ernest was made plant manager of a marine pump and valve factory. Mrs. Jarvis worked as a chemist in the laboratory.

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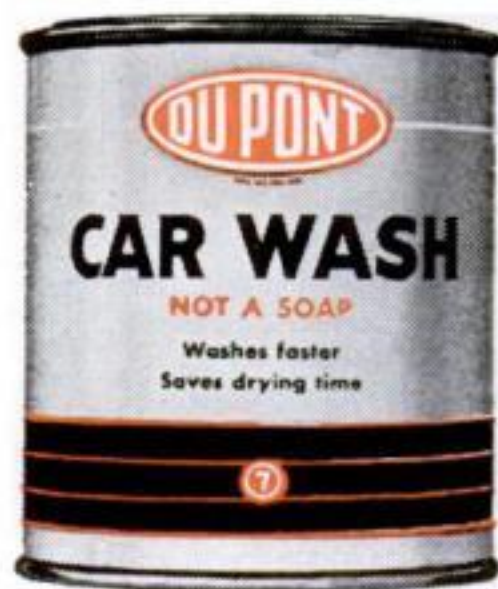
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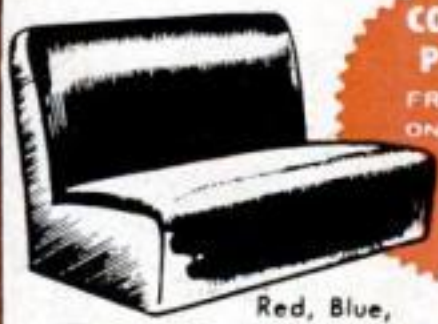
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Letters



A General Says "Well Done"

Many thanks to POPULAR SCIENCE MONTHLY for publishing the fine article by Joseph Stocker on Civil Air Patrol's search and rescue work, "Trouble Is Their Pastime" [Jan. '52, p. 96]. I consider this story exceptionally well written.

GEN. CARL A. SPAATZ, USAF Ret.
Civil Air Patrol

Bolling Air Force Base, Washington, D. C.

Planes Take to the Road

In your January issue [p. 106] I saw a picture of a truck 91 feet long moving the tail section of a B-36 bomber in Texas.

I would like you to take a look at this picture [below] showing three trailer trucks



each carrying the fuselage section of a B-29 bomber 105 feet long, 17 feet high and 12 feet wide.

As the driver of one of the trucks, I think this was much more of a load than the tail of the B-36. The planes were moved from Pyote Air Force Base in Texas to Denver—some 800 miles. We had to make the trip under special permits that prohibited traveling at night, on Saturdays after noon, and on Sundays and holidays.

FRED L. BORN, Oklahoma City.

Burning Up the Road Burns Car

In your October and January issues there were accounts of drivers filling their tires with straw and then running on them [Oct. '51, p. 103; Jan. '52, p. 14]. This may be so, but I would like to tell you about a similar case that had different results.

Returning late one night from a motor trip, we had a flat tire traveling at high speed that ruined the tube. Since there was no chance of getting another tube at that

time of night, we stopped at a farm house, bought several gunny sacks, rolled them up as tight as we could and stuffed them in the tire.

Everything was fine until a highway motor cop stopped us and said our brakes were burning. It wasn't the brakes, but the sacks were a glowing mass of charcoal and the



tire was a melted mass of rubber. The friction had set the sacks on fire, so we had to ride home on the rims.

C. M. HUNTLEY, Seattle.

You'd Get Plenty Cold Out There

In your article "How the World Is Shrinking" [Jan. '52, p. 137], Mr. Ley stated that something placed in the shadow of a space station would be cooled nearly to absolute zero.

But if an object were placed outside the space station it would be surrounded by a vacuum. Although a perfect vacuum has a temperature of absolute zero, it won't absorb heat like a chunk of ice. The object would not be cooled, but would be insulated against temperature change because a vacuum won't conduct heat.

LEE MORSE, West Union, Iowa.

A vacuum won't absorb heat or conduct heat, but neither will it block the transmission of radiated heat. Otherwise, how would we receive heat from the sun? So an object placed in the shadow of a space station, where it could not be warmed by the sun, would quickly radiate all its heat away and approach absolute zero.

Ready for Anything

In your January issue [p. 81] you had an article "Death Designed This Fire Truck" about the East Orange, N. J., rescue truck.

Allow me to inform you that Rescue No. 1 of the Providence Fire Department has the same equipment with the exception of the chainsaw. Also we have a portable iron lung, shallow- and deep-diving equipment, experienced divers, and a 14-foot unsinkable

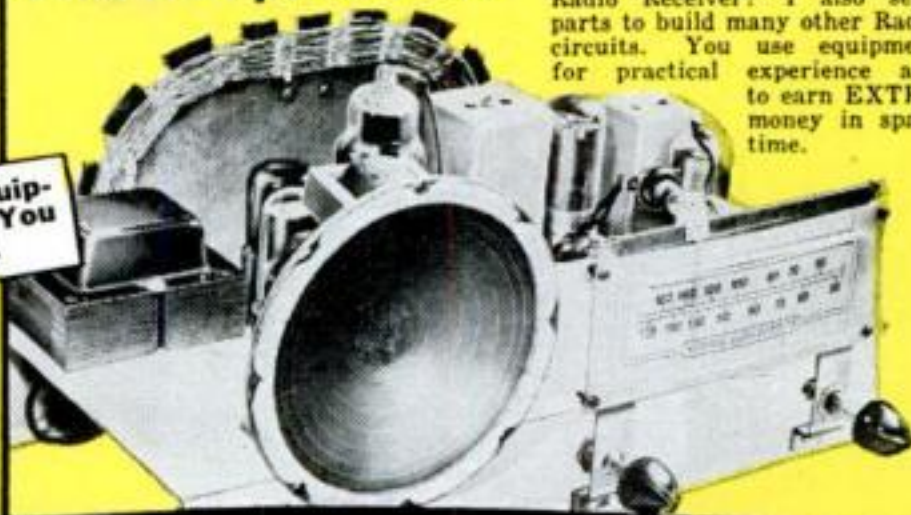
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EDWIN A. FAY, Providence Fire Department
Providence, Rhode Island.

In Defense of Wrenches

Your "Hints from the Model Garage" in March [p. 200] showed how a pair of wrenches for working on a car's fuel and brake lines can be made by cutting a box wrench in two and filing in each box a slot slightly larger than the tubing.

It would be rather silly to spoil a perfectly good box wrench, which is needed for so many other purposes, when the slotted-flare, nut-type wrenches are available through any automotive distributor. They are also available through refrigerator distributors who have far more tubing work than the average automotive mechanic encounters.

E. S. SENDERFER

Bonney Forge & Tool Works, Allentown, Pa.

Anyhow, You Shouldn't Do It

In the February Letters column, John W. Nestler asks for a coined word to describe crossing the street against a red light, just as "jay-walking" describes crossing at other than an intersection.

I'd like to suggest "light-crashing."

E. P. ERNEST, Washington, D.C.

How about "red-erring"?

GEORGE BELLAMY, Cooperstown, N.Y.

Bats are color blind, so "bat-walking."

FRANK M. BROWN, Fayetteville, Ark.

"Red-beating."

HARRY WYMAN, Brooklyn.

Pirates used to make their prisoners walk the plank. Why not "plank-walking"? The result is the same.

CHESTER L. KINSCH, Palacios, Tex.

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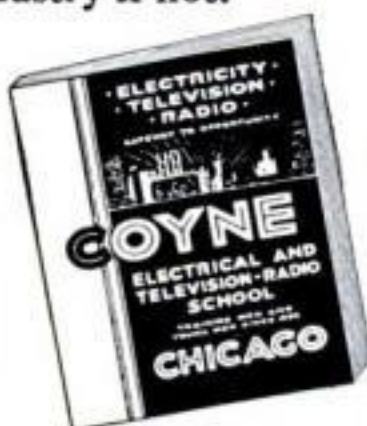
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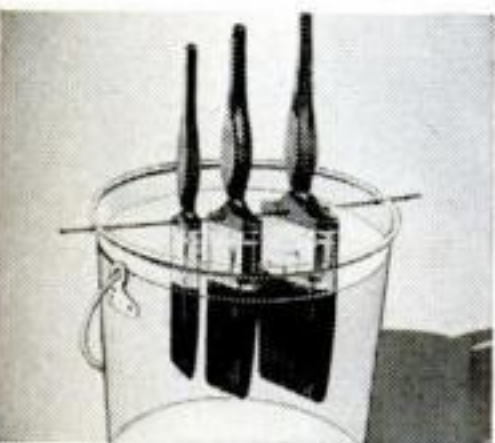
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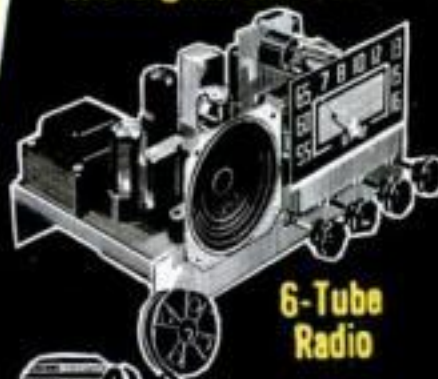
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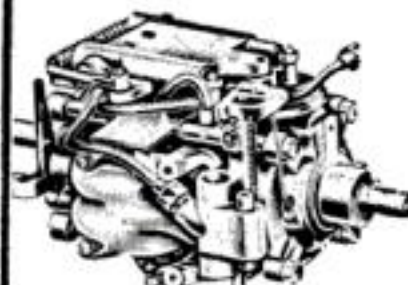
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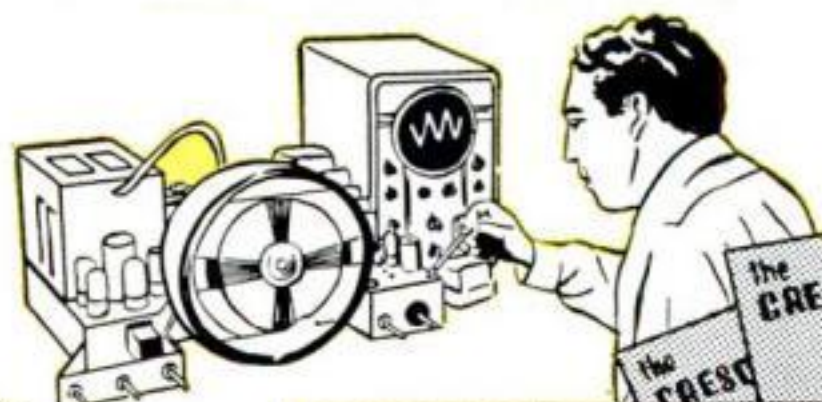
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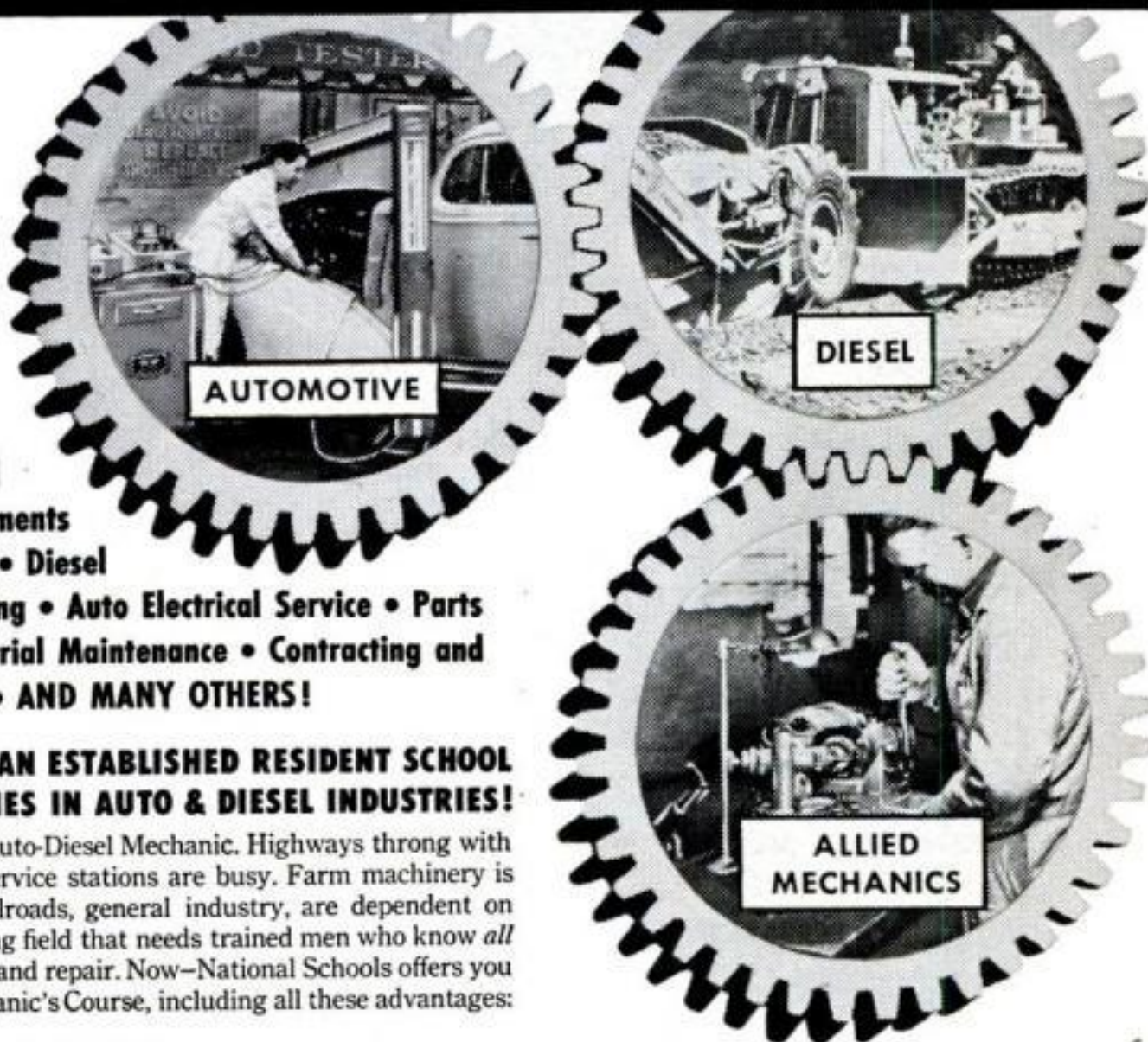
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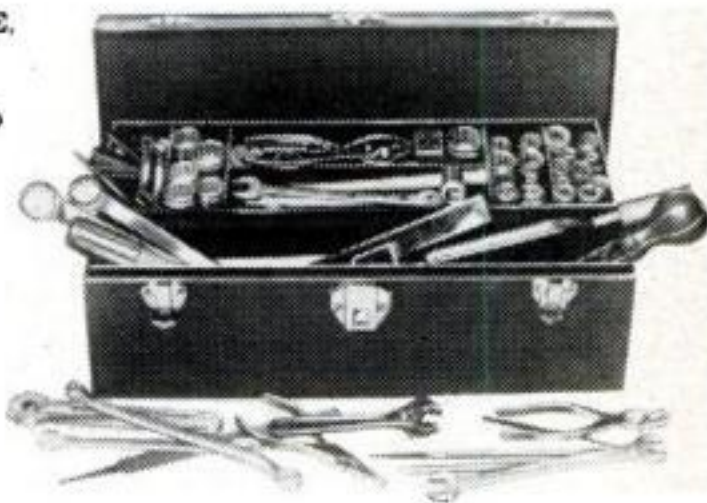
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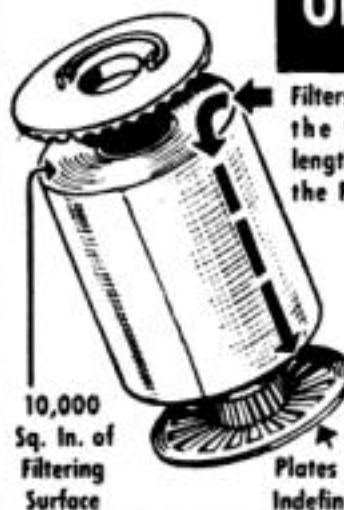
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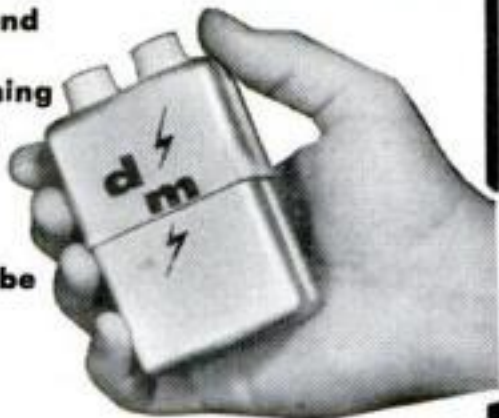
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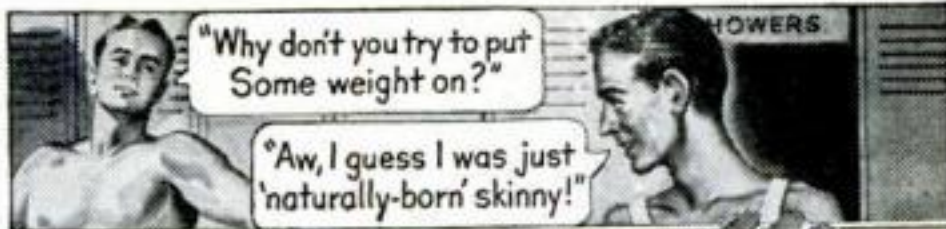
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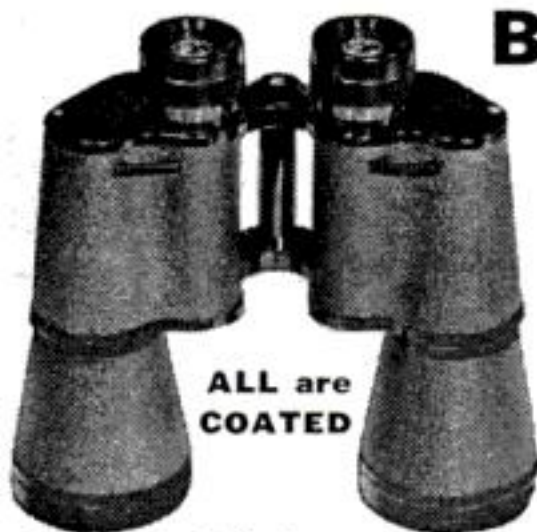
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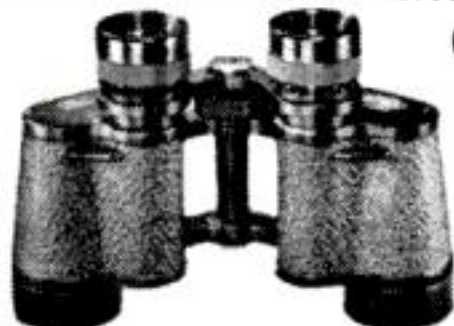
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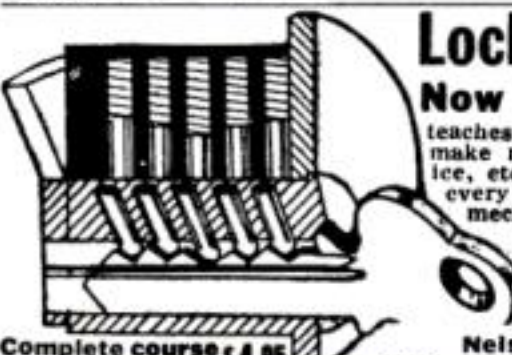
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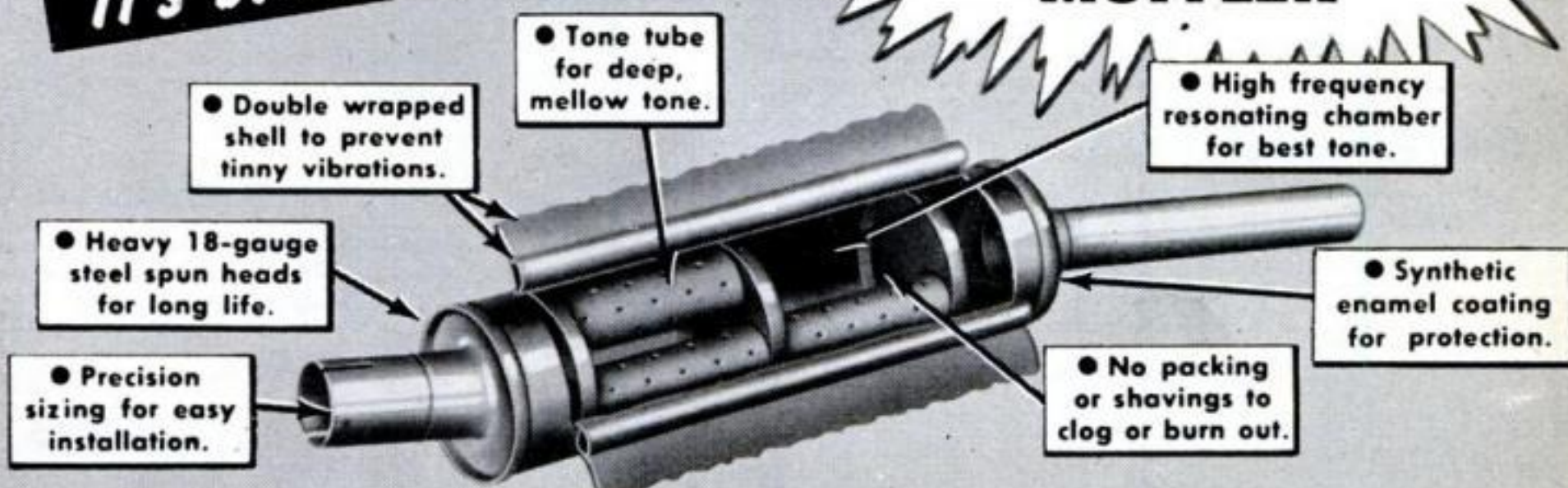
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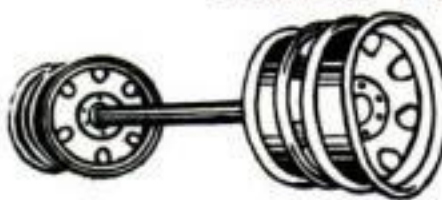
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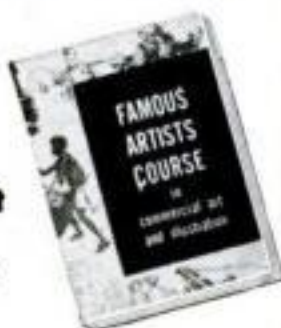
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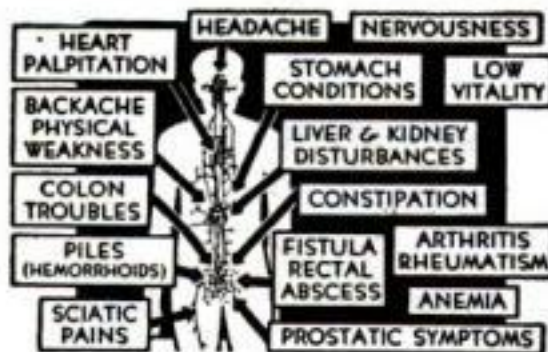
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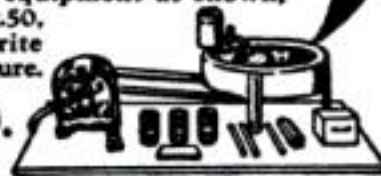
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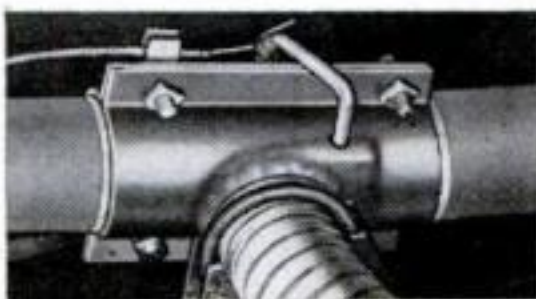
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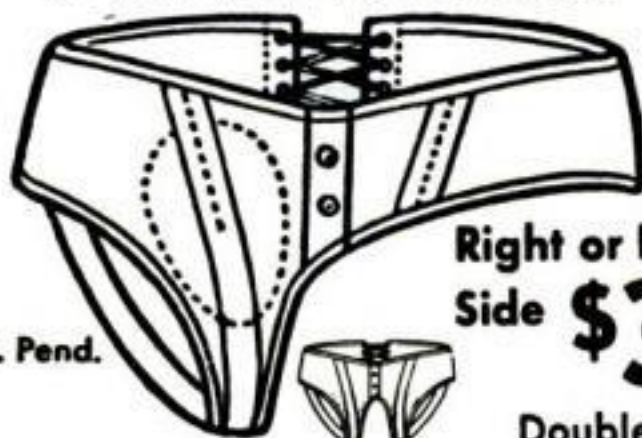
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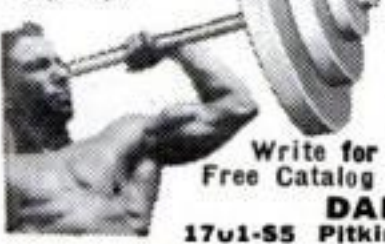
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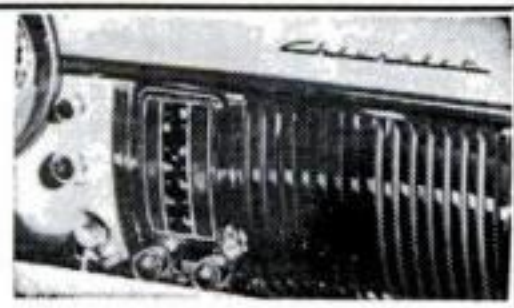
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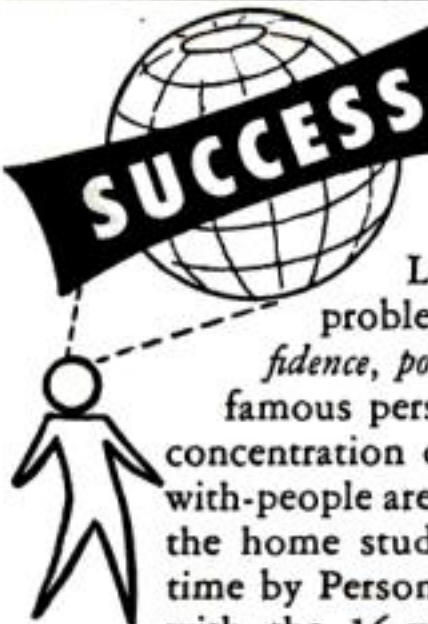
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DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

\$10,800 PROFITS At Home! Lifetime Opportunity! Free advertising method builds your own Home Mailorder Business! Capital, experience unnecessary. Start spare time. No merchandise investment! No advertising risk! Exciting, practical. Copyrighted, notarized proven successful plan 25c. Satisfaction guaranteed! Treasury, 149 Storer, New Rochelle 8-P, New York.

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21 POPCORN, Candy Apple Formulas, proven money-makers. Send \$1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, O.

SPARETIME Profits Taking Subscriptions All Magazines. Wholesale Catalog Free. Cassell Publishers, Westfield 1, N. J.

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MAKE Money at home with your typewriter. Details Groves Company, 682, Hastings 3, Nebraska.

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WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

PRINT Without A Printing Press. Big Money! See page 50.

FREE Folder—100 Ways To Make Money in Silk Screen Printing. National, Box 88-PS, Dorchester 22, Massachusetts.

EASY Money! Earn to \$100-\$200 per month addressing envelopes in your spare time at home. Send \$1.00 for complete instruction booklet to King Company, Dept. PS, 681 Market St., San Francisco 5, Calif.

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MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 10, New York.

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39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

DIAMONDS from Coal. Theory—Processes \$1.00. Andrien, c/o 2307 So. Logan, Milwaukee.

HOT Tamale making for Profit. Particulars write, F. E. Skinner, 419 W. Live Oak Altus, Oklahoma.

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PLASTIC: sheets, rods, tubing: Lucite, Acetate, send \$1.50 for 4 pound assortment and instruction manual. Regal Plastic Supply, 720 Main, Kansas City 6, Missouri.

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LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

NEW Idea Chemical and Apparatus Outfits for Home Experimenting. Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

SPECTROSCOPE for quick chemical analysis \$3.00. Cutting Sons, Los Altos 2, Calif.

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42 HELP WANTED

FOREIGN & Latin American Employment 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring, \$1.00 post-paid. Global Reports, P.O. Box 883-S, Hollywood 28, Calif.

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ALASKA—Last American Frontier, \$1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation, List of firms hiring, How-When-Where to apply. Alaska Opportunist, P. O. Box 883-S, Hollywood 28, California.

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IMMEDIATE openings offered—Honolulu. Help wanted columns airmailed \$1.00. Pomeroy's, #3 Campbell Block, Honolulu, Hawaii.

FOREIGN Jobs, Contracts underway and soon starting in Africa, South America, Canada, England, Europe, South Pacific, Middle East, Mexico and Alaska. Send \$1.00 for foreign job news, information, application forms, etc. DCS Foreign Job News, Dept. 268-DL, Bridgeport, Ill.

\$1,000,000 CONSTRUCTION Projects, "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. \$1.00 complete. Global Reports, P.O. Box 883-PX, Hollywood 28, California.

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FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

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AMAZING but true! We pay you daily cash for giving women privilege wearing wonderful nylon stockings at our risk. These beautiful sheer nylons cost nothing unless satisfactory! Yet, you get advance cash plus huge bonus that increases your earnings by 40%. Postcard brings you free sample stocking and complete money-making outfit. No obligation. Kendex, Babylon 84, New York.

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IS \$210, a week worth a postcard to you? Then rush card with name and address for special Free Trial Plan that sells amazing new Automatic Refrigerator Defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. H-103, 173 W. Madison, Chicago 2, Illinois.

\$100 WEEKLY. Power mowers. Wholesale deal. Guaranteed sales. Rotacut-52, Excelsior Springs, Missouri.

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MEXICAN Feather Pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. (No Coins). Sylvias. Apartado 9036, Mexico City.

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CALIFORNIA sweet smelling beads, sensational sellers. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

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ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. E-101, New York 11, N. Y.

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REPRESENT America's largest factory selling advertising pencils. High commissions. Attractive line. Send \$1.00 for pencil kit (refundable). Union Pencil Company, 389 Broadway, New York City.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-552, 7530 Greenwood, Chicago.

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BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" Bookkeeping and Tax Service. Full or spare time. Details Free. No obligation. Ellis, Box 203-E, Cedar Grove, N. C.

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CURE yourself of stammering at home. Complete Instructions \$1.00. John E. Thompson, Gastonville, Pennsylvania.

BARTENDING—School or Home Training. American Bartending School, P-334 S. Wabash, Chicago 4, Illinois.

46 CONTESTS

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\$1000 WON by client. Contest Service, United 13 Earl, Red Bank, N. J.

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DETECTIVE Training. Phillips Secret Service System, 1917-C North Kenneth, Chicago 39, Ill.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write, Wagoner, P-125 West 86th, New York 24.

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RIBBONS. Pads Typewriters, Adding Machines, 10c bargain catalog. G & T Typewriter Supplies, 131 Chatterton, White Plains, New York.

TYPEWRITERS. Printing Devices. Office Machines supplies appliances. Dixie Graph, King, N. Carolina.

SAVE 10%—new portable typewriters. Anywhere. Write Brackley, Farmington, Me.

TYPEWRITERS \$22.50. Duplicator, adders \$12.95; Meier's, 118 Spruce, Wichita, Kansas.

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BETTER Quality! 3 lines, \$1.00; one, 40c. Fast service. Printing, etc. Catalogue, Johnson Press, Box 6-B, New York City 26.

3 LINES 50c; Pads 35c; Signatures \$2.35. Printright, Wauwatosa, Wisconsin.

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QUALITY Printing. Stationery, circulars, booklets, publications. Free catalog. Adams, 30 West Washington, Chicago 2, Ill.

INTRODUCTORY offer: 100 8 1/2 x 11 Letterheads \$1.00 prepaid. Albert Weeks, 342 Woodycrest, Nashville 11, Tennessee.

PRINT Without A Printing Press. Big Money! See page 50.

200 LETTERS mimeographed on printed letterheads 8 1/2 x 11 only \$2.00; 500 \$4.25; 1,000 \$6.10. Ross S. Weygandt, Box 313P, Wooster, Ohio.

MIMEOGRAPHING. Screen printing. Posters (any copy). Mailing. Lowest prices. Sinclair, Box 762, New Orleans 2, La.

PROFESSIONAL personal stationery. Wholesale. Free Samples. Lynn Peltcher, 4804 Voltaire, San Diego 7, Calif.

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MILITARY Stationery Name, insignia, processed gold, large box \$1.95 cash. Wainwright, Dolgeville, New York.

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PRINT your own cards, stationery, circulars, advertising. Save money. Simple rules. Print for others, nice profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, L-8, Meriden, Connecticut.

PRESSES. Supplies. Paper, catalog 10c. Custom, Box 211-S, Springfield, Missouri.

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C. A. Snow & Co.—S-427, Snow Building, Washington 1, D. C. Registered Patent Attorneys. Write for information.

INVENTORS: When you are satisfied that you have invented something of value write me, without obligation, for information as to what steps you should take to secure a Patent. Write Patrick D. Beavers, Registered Patent Atty., 938 Columbia Bldg., Washington 1, D. C.

INVENTORS: Write for free brochure "Evidence of Invention." Labiner, World Building, New York 7.

"INVENTOR'S Guide" free, Frank B. Ledermann, Registered Patent Attorney, 154 Nassau Street, New York.

INVENTORS: Learn how to protect your invention. "Patent Guide" containing detailed information concerning patent protection and procedure together with "Record of Invention" form will be promptly forwarded to you upon request—without obligation. We are registered to practice before the U. S. Patent Office and prepared to serve you in the handling of your patent matters. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 22B-D District National Building, Washington, D. C.

INVENTORS. For "Invention Record" form, contact Carl Miller, Registered Patent Attorney, Woolworth Building, New York.

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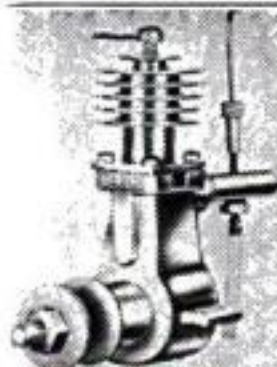
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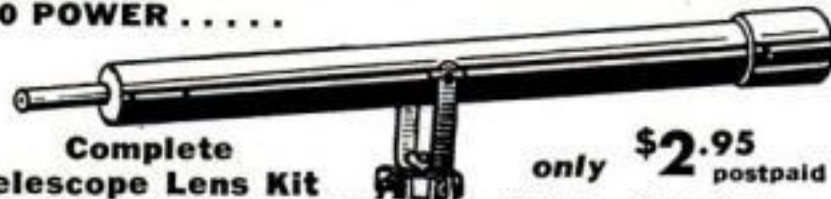
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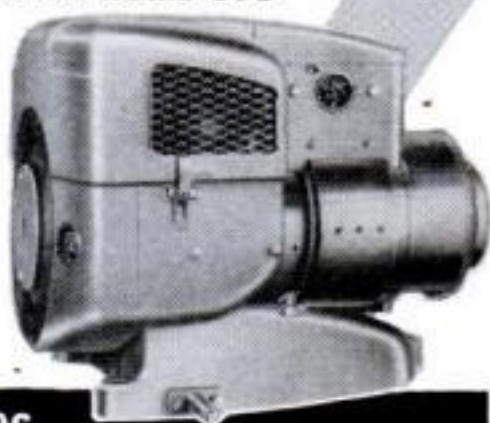
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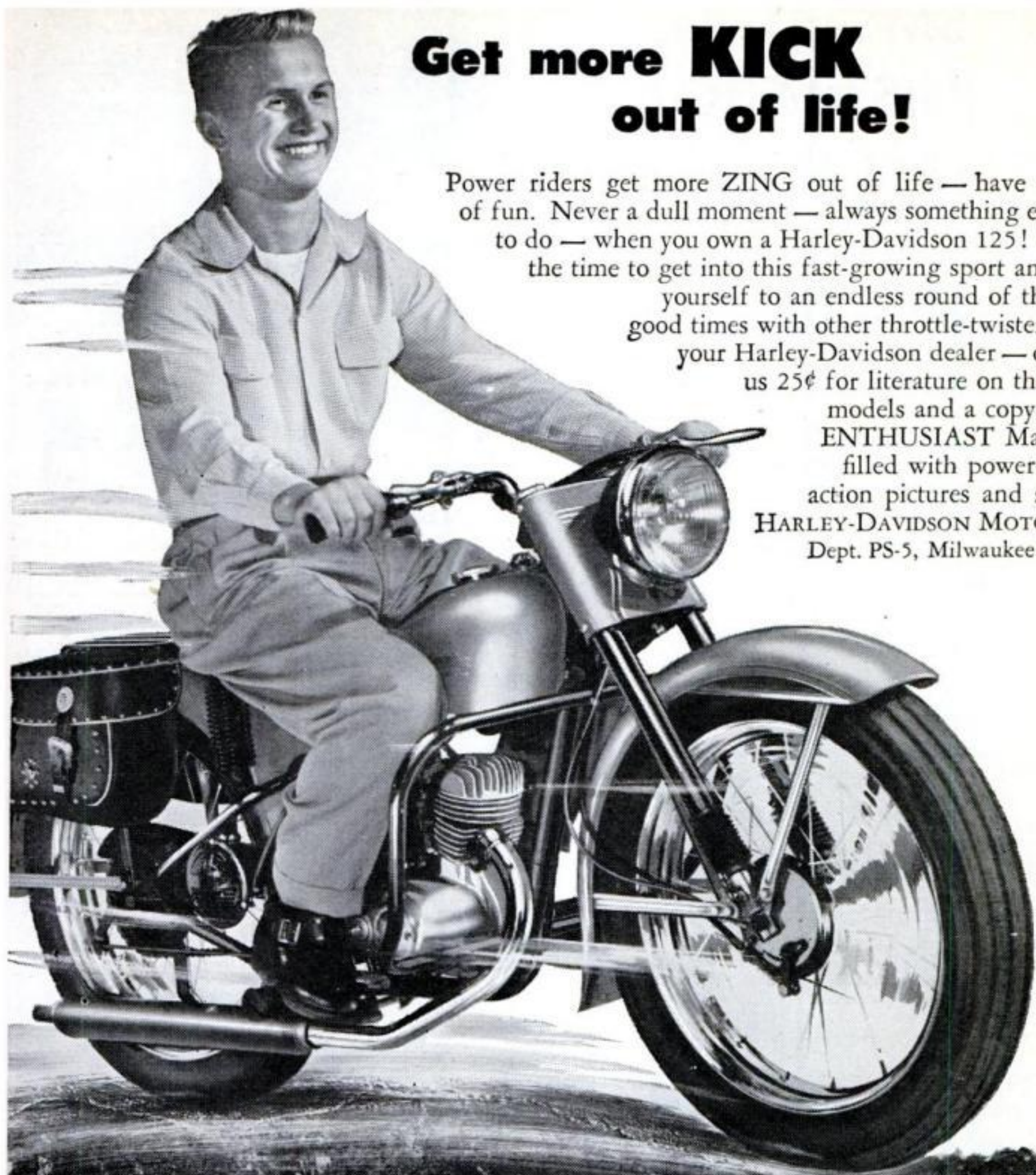
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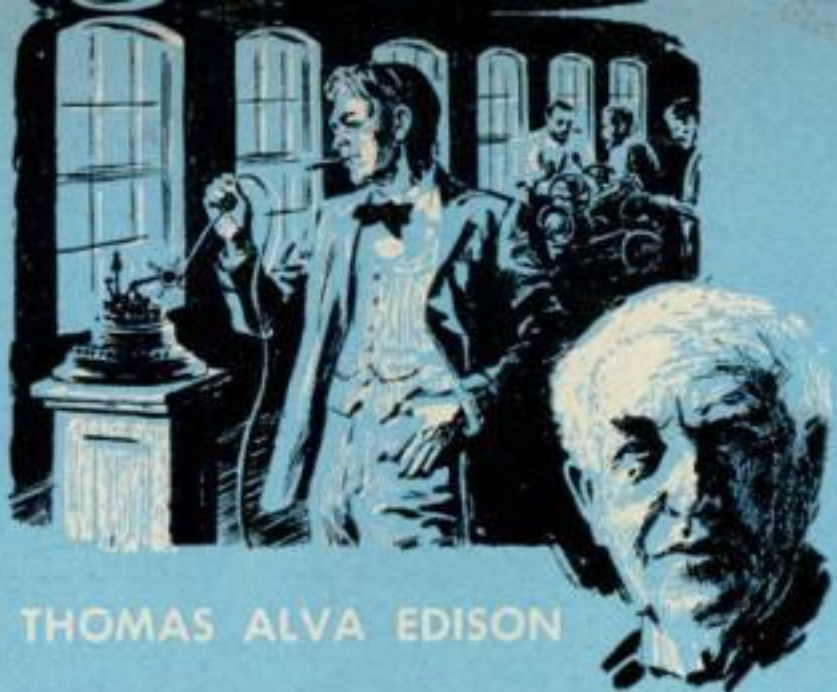
Look for this Authorized emblem...

on the engine and parts you buy. It's backed by the Authorized Reconditioner's Warranty. Any defect in material or workmanship appearing in 90 days or 4,000 miles . . . whichever occurs first . . . will be remedied at no extra charge by the dealer from whom it was purchased.



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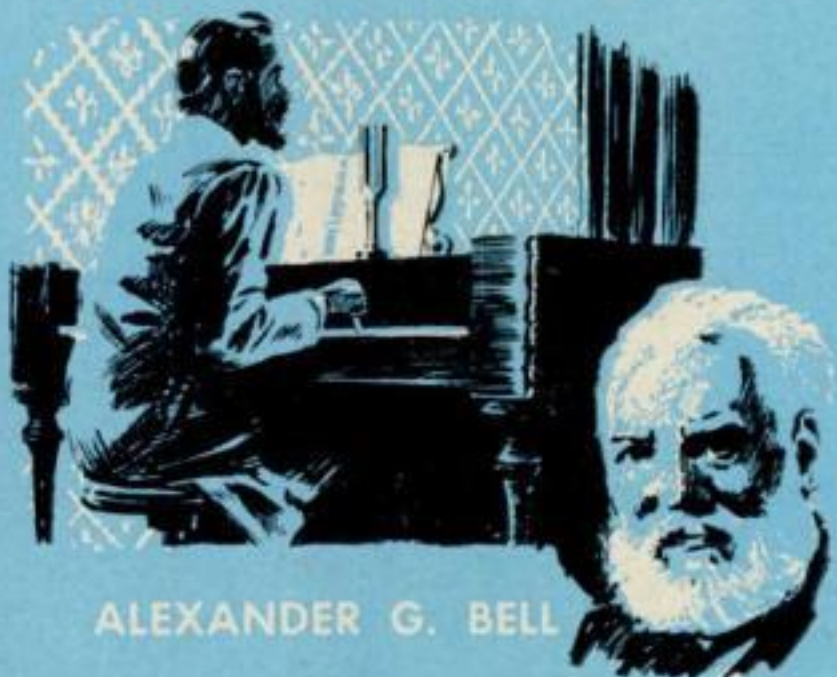
. . . carburetors, clutch discs,
voltage regulators, fuel pumps,
distributors, generators,
starting motors, brake shoes.



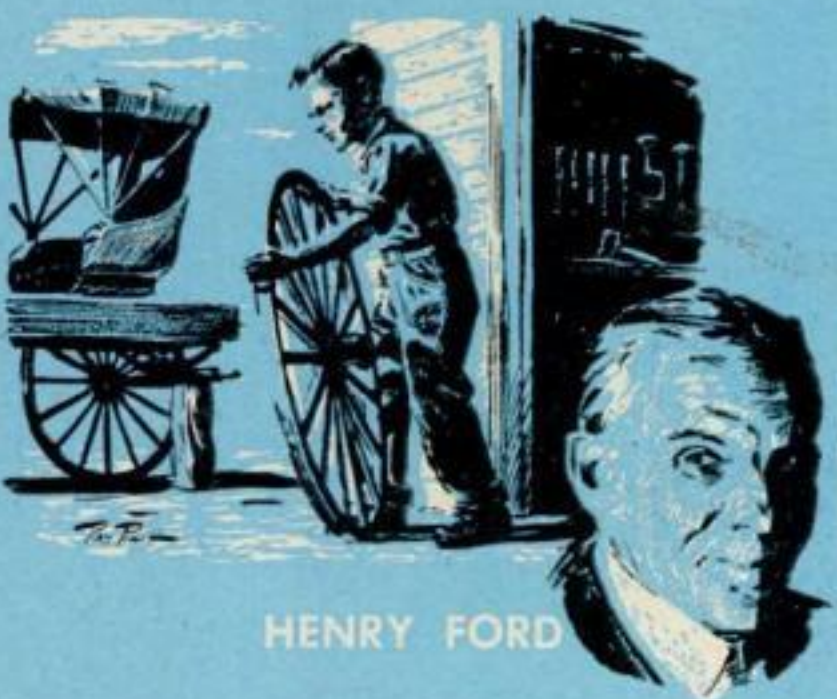
THOMAS ALVA EDISON

80 years ago...

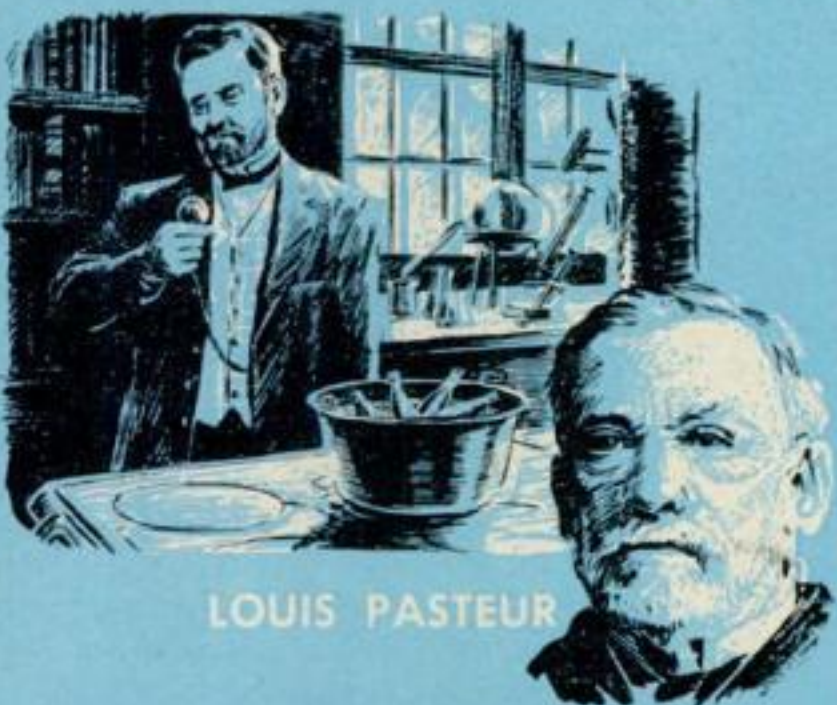
POPULAR SCIENCE MONTHLY began its distinguished career in May, 1872. In that same year, Thomas Edison, 25, perfected the stock ticker and still found time to work on 45 other inventions. His incandescent electric light lay six years ahead. Alexander Graham Bell, also 25, was making experiments with tuning forks and piano strings that led to his creation of the telephone four years later. Henry Ford was a farm boy of nine, forever building things with his treasured small stock of tools. Louis Pasteur, 50, was proving that pasteurization, a process that got its name that summer, helped purify and preserve beer. This was nine years before he demonstrated the effectiveness of his method of vaccination. Between then and now, the inspirations of these men and others have changed the way of life of all civilized peoples.



ALEXANDER G. BELL

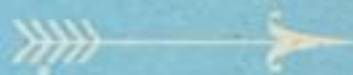


HENRY FORD



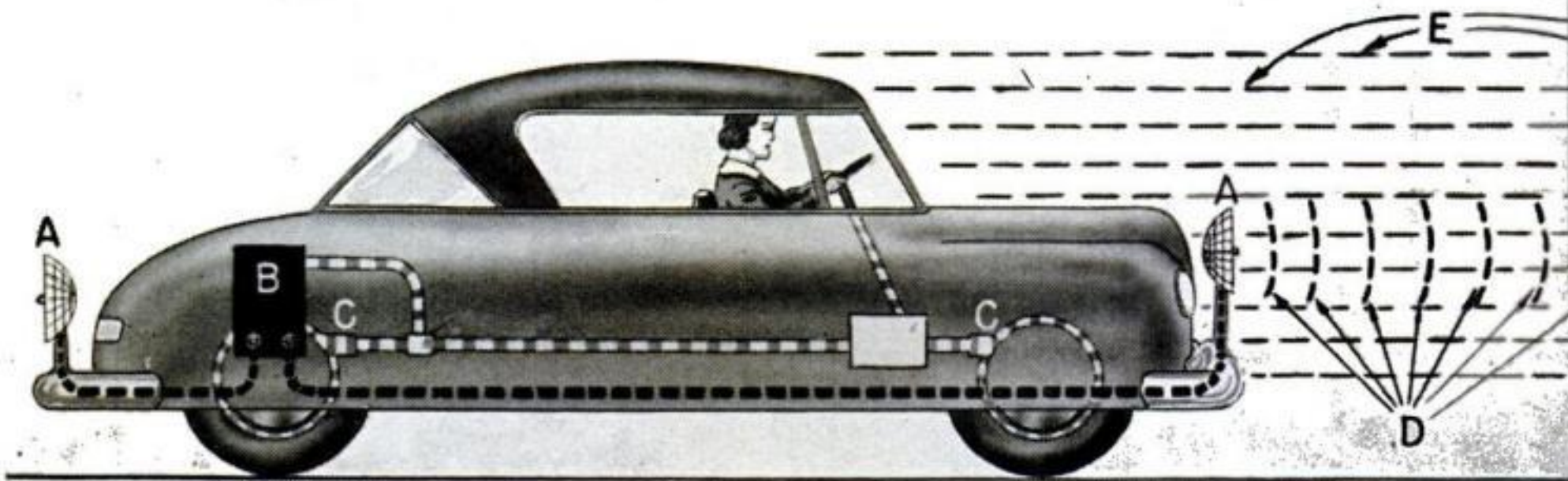
LOUIS PASTEUR

What will they think of next?

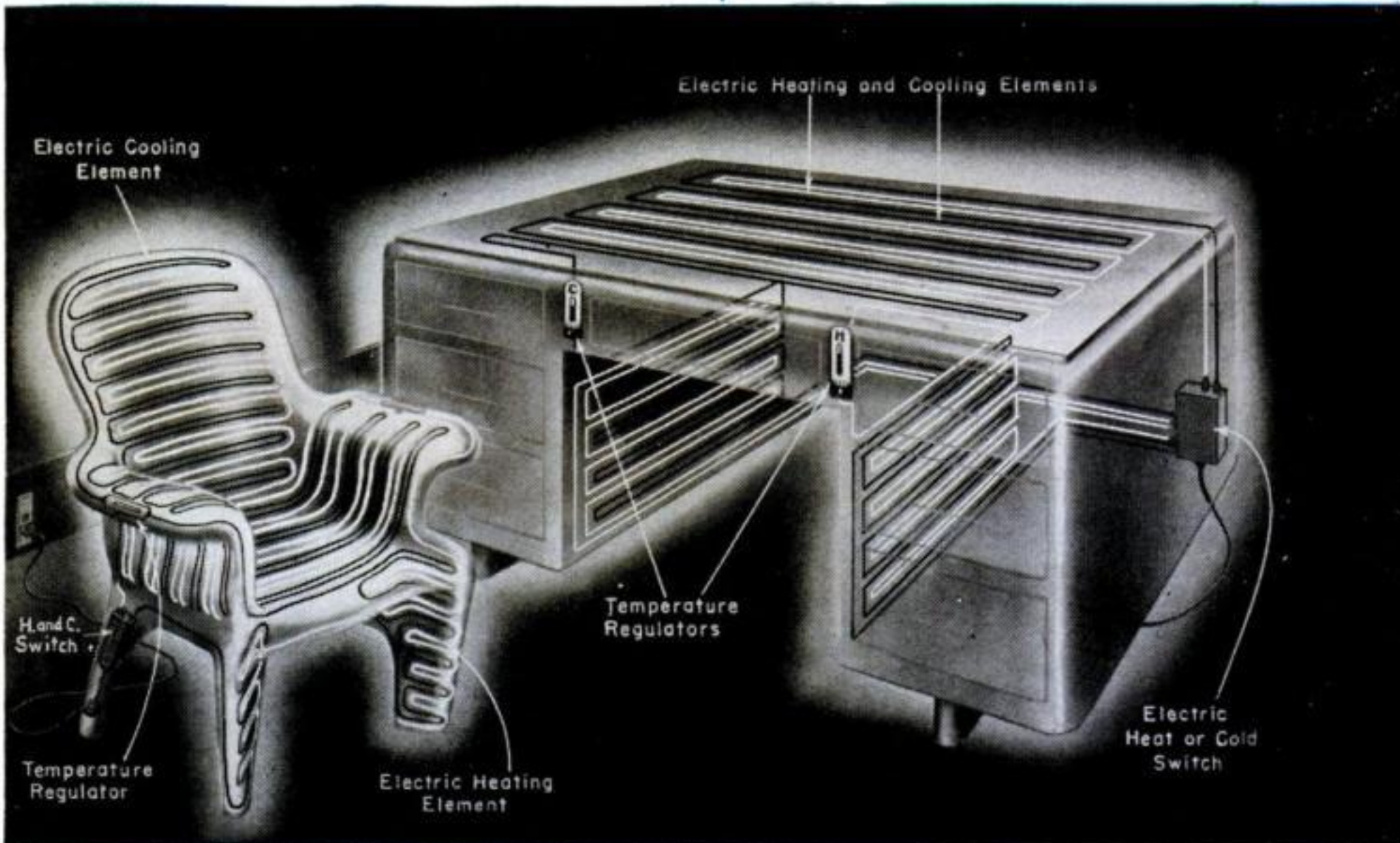


EDITOR'S NOTE: *The London Daily Express* (circ. 4,240,200) once called Hugo Gernsback, 67-year-old editor and publisher of *Radio-Electronics*, "the world's greatest prophet." He predicted radio loudspeakers and chain broadcasting back in 1909, radar and television in 1911, atomic artillery in 1915 and radio contact with the moon in 1927. His earlier prophecies were made in installments of a pioneering science-fiction story called "Ralph 124C 41+." His current prophecies—what the world will be like in 2032—are presented here.

such as Gernsback foresees will function something like this. In case a crash is imminent, radar waves (D) and the effect of the electrical field of one



as the author imagines it, will be of metal, laced with electric heating and cooling circuits. The sitter can set the thermostats for any temperature he likes.



**A noted prophet with a high batting average takes a crack
at predicting some of the wonders the future will bring.**

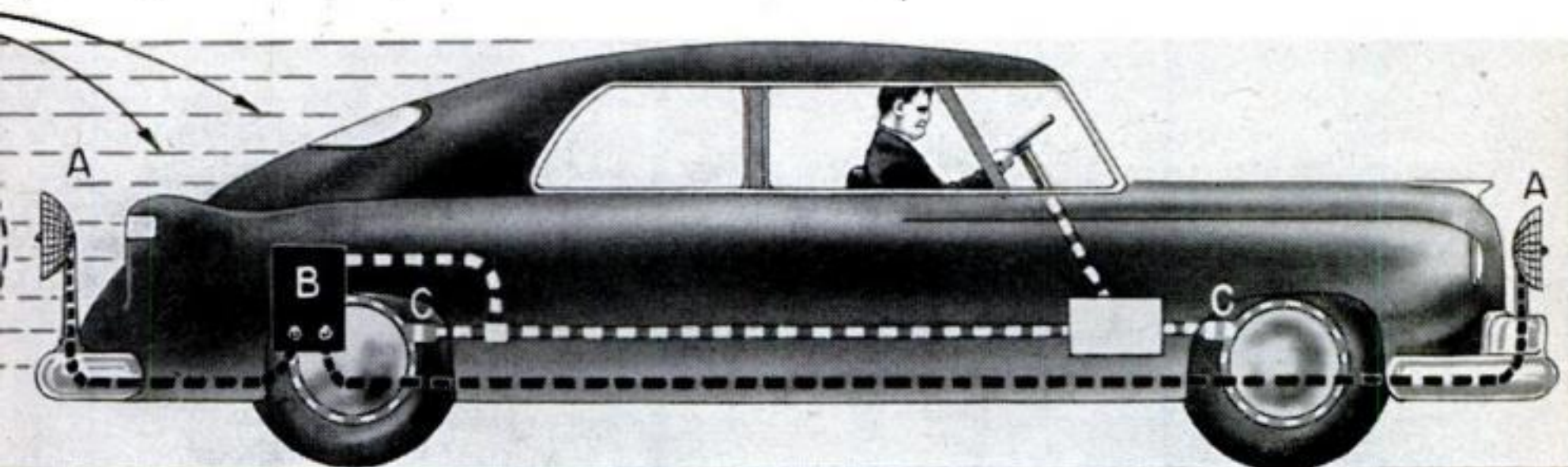
By Hugo Gernsback

SCIENCE moves at so swift a pace that what seems too fantastic to take seriously today has a good chance of coming true tomorrow. Accordingly, there is no telling what wonders are in store for us 80 years from now.

I predict, however, that by then we will have cars that avoid collisions by themselves, with no help from the driver. I predict that electronic brains will be deciding who is to marry whom, and that therefore there will be many more happy marriages than there are now. I predict that we will be able to heat or cool our furniture, and that

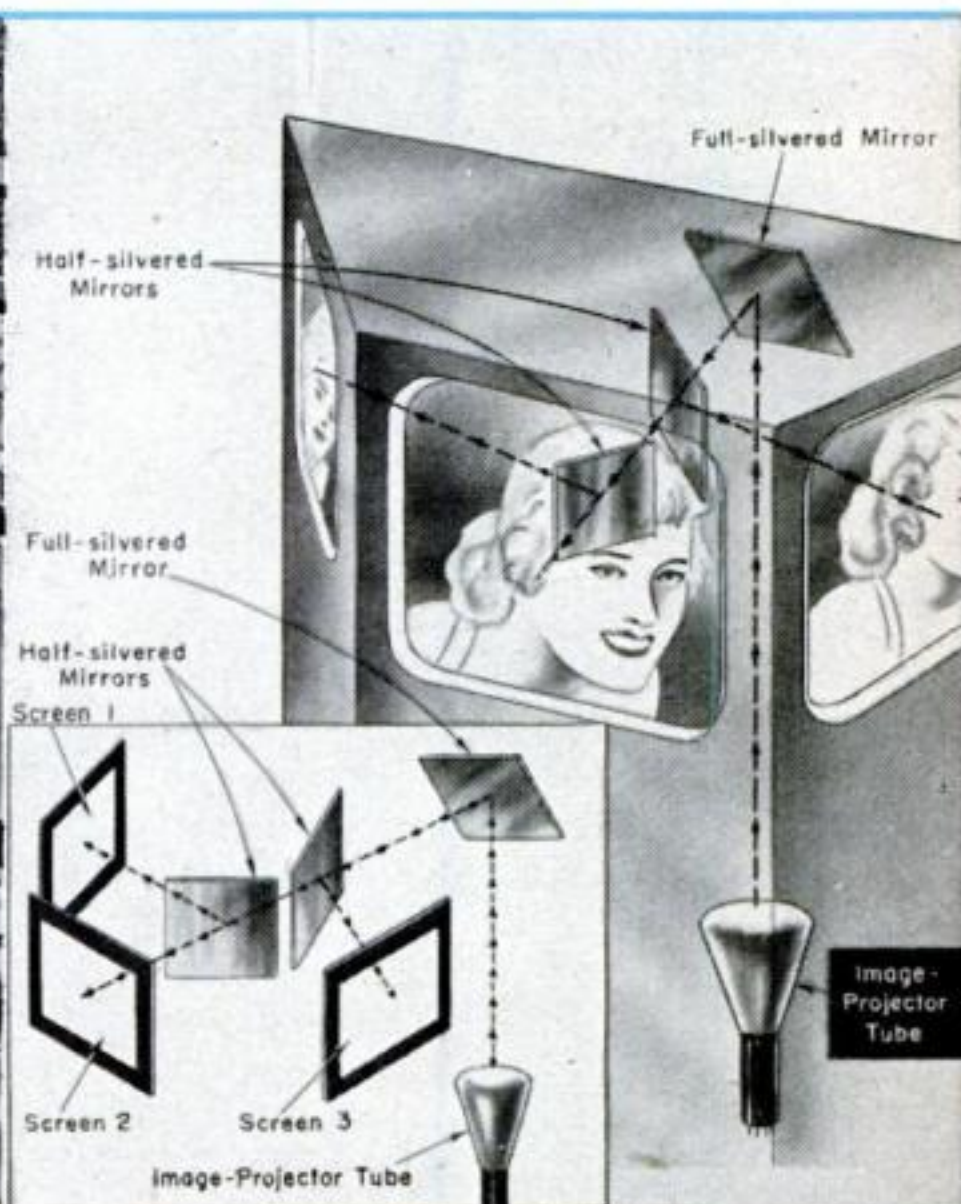
car upon that of another (E) will cause a radar-wave collector (A) to signal an elec-

tronic brain (B), which will apply brakes (C). Similar setup will avoid sideswipes.



will let a calculator choose
ideal couples, bring about happier marriages.

can be produced
with three screens or, as below, mirrors.



three-screen TV sets will be commonplace.

There is no valid reason for not equipping cars with anti-collision electronic devices. I can visualize an electronic system which embodies a combination of a simplified, special radar plus a capacitance-effect device—both acting together. Such a system should give us a greater margin of safety to prevent or minimize collisions.

True, such improved cars will be more expensive than present-day ones, but it is a certainty that the public will want them—at almost any price.

With constantly increasing car speeds, no human can be trusted always to stop a car quickly enough to avoid accident. Human reactions are too slow. With a car moving at 60 miles an hour, let us picture a common situation. From a shrubbery-obscured side street another car moves across the main road. The driver of the first car sees the

other car 75 feet away. But it takes about three-quarters of a second for him to apply the brakes. In that time his car has traveled 66 feet. Then the car's momentum will cause it to cover, say, 185 feet before it can be brought to a dead stop. Thus the first car will have traveled 251 feet from the moment its driver sighted the second car until it was stopped. Result—unless both cars manage to swerve—a bad crash.

Electronics Will Slam on Brakes

Why will an electronic control be better in such a situation than the driver? The answer is that human reactions are not instantaneous; in an emergency a driver rarely has sufficient time to put on his brakes—but electronics can do it *instantly* when the car gets in the danger zone. True, not all collisions will be prevented, but the force of the impact will be greatly reduced. It will make the difference between death and injury.

The electronic anti-collision device need not be very large or cumbersome, perhaps not much larger than a medium table radio. It will have a rudimentary radio brain that will also make certain decisions as to when and where *not* to put on the brakes.

I would use electronics, also, to help reform our customs and our approach to marriage, which still remains man's greatest gamble.

Science May Choose Your Marriage Partner

Let us begin with a workable plan. A group of bright young research scientist-psychologists should be organized under the tutelage of a brilliant and able leader, such as Dr. Alfred C. Kinsey, author of *Sexual Behavior in the Human Male*.

The group of researchers then will interview 25,000 or more married couples. They will be armed with lengthy questionnaires as well as special test equipment. After a few years they will have ascertained which of the 25,000 marriages were successful and which were not. Like the original coded and self-proving Kinsey questionnaire, these marriage questionnaires, by eliminating any possible false answers, will be as perfect as modern science and ingenuity can make them.

The questionnaire and tests will go exhaustively into heredity, individual taste, sex habits, education, race, color and texture of skin, IQ, general health, past illnesses, texture of hair, Rh blood factor, odor prefer-

[Continued on page 242]



75 years ago this month

Popular Science Monthly reported:

"THE two islands of New Britain and New Ireland, lying east of New Guinea, have been visited by a Wesleyan missionary, Rev. George Brown, who has explored 150 miles of the coast of the former, and 100 miles of the latter. Mr. Brown also crossed the latter island and made large natural-history collections. Abundant evidences of cannibalism were found, but the natives live chiefly on bananas, cocoanuts and pork. No white man had ever been seen inland before, but no opposition was offered to the explorer."



Which End Is Which?

It's hard to tell whether this German car is coming at you or just leaving. The windshield-like rear window and large center tail light (above) look like the real front (right). A supercharged 40-horse engine gives a top speed better than 125 m.p.h. Note the four exhaust pipes and transparent roof. Designed by Rudolf Haller, a speedboat and airplane builder, the car cost \$5,000.



Track Officials Get Lift

AN ELECTRIC lift truck is speeding up pole-vault events at track meets. Officials riding the lift can quickly take measurements or replace the crossbar. Previously they had to use tall, rickety ladders and long forked poles. The truck is a standard Yale & Towne model like those used in industrial plants.



Cabana Folds for Travel

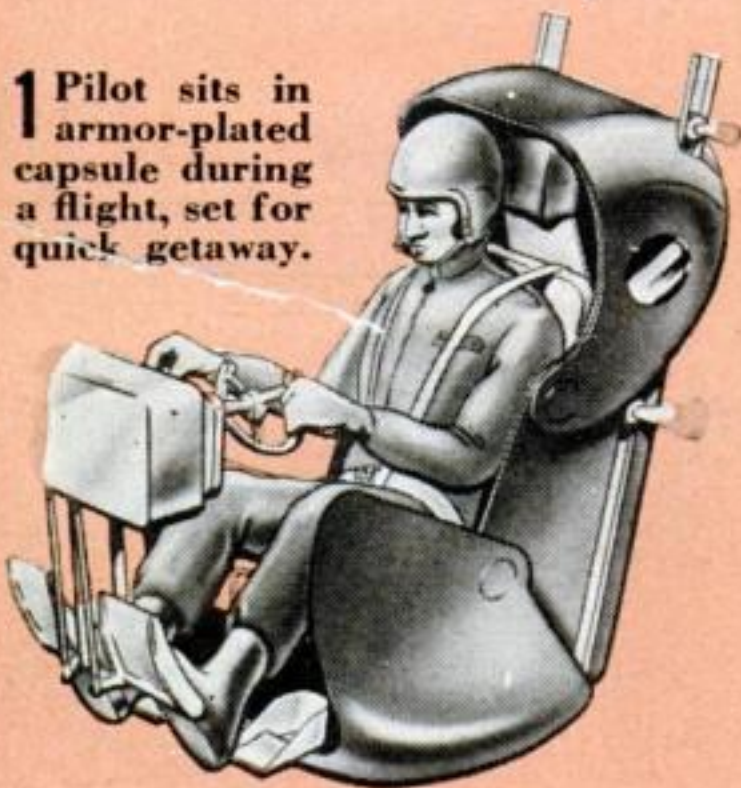
THIS plastic cabana can be folded into an underarm package when you leave the beach. Set up, six anchoring points in the inflatable base prevent tipping. A rustproof plastic slide fastener on the entrance flap can be worked from either inside or out. The Bilnor Corp., Maspeth, N.Y., makes the cabana.

Exit Pod Fired from Jet



FLIERS of tomorrow's supersonic planes will catapult to safety enclosed in armor plate like a seed in a pod. The Navy capsule below, developed by Goodyear, will protect them from the sledge-hammer blows of supersonic slipstreams and the 65-below cold of the stratosphere.

1 Pilot sits in armor-plated capsule during a flight, set for quick getaway.



2 To catapult, flier places his feet on foot-rests, pulls pre-drop handle.



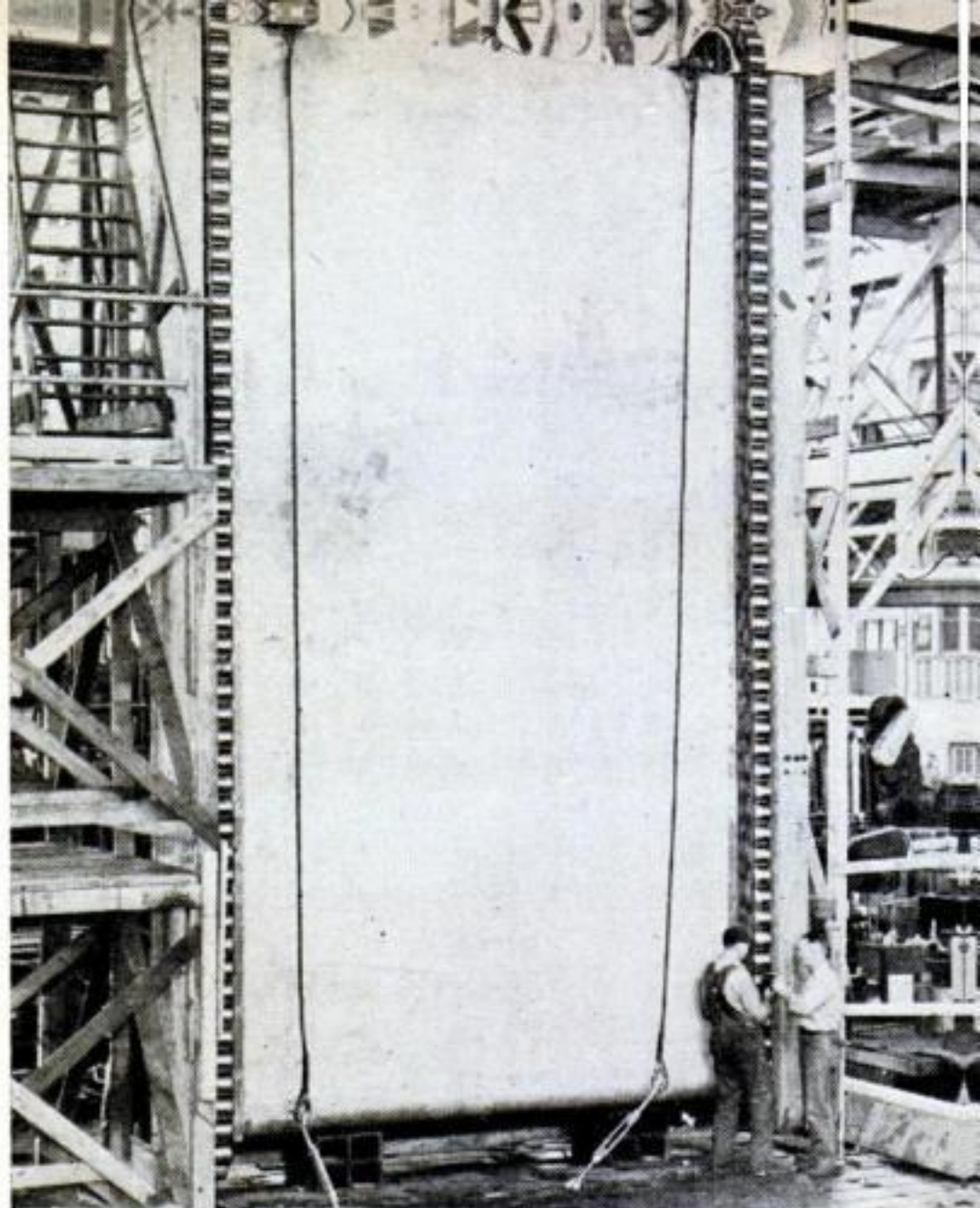
3 Seat retracts into capsule and is locked in place. Doors begin to close.



4 Doors lock, after closing clamshell fashion. Escape hatch is then jettisoned, arming the catapult.



5 Catapult is fired as flier pulls head-retention curtain over his face. Unit is pressurized and contains oxygen equipment.



55-Ton Gate to Harness River

THIS huge intake gate will harness the rush of water at Garrison Dam on the Missouri River, 75 miles upstream from Bismarck, N. D. The 55-ton steel giant is 27 feet high, 14½ feet wide, 3½ feet thick. When the frame is embedded in the concrete face of the dam, a cable hoist will lift and lower the gate on stainless-steel bearings riding on a track. It is one of 10 gates being built by Westinghouse for the Army Engineers' Missouri River Basin project.

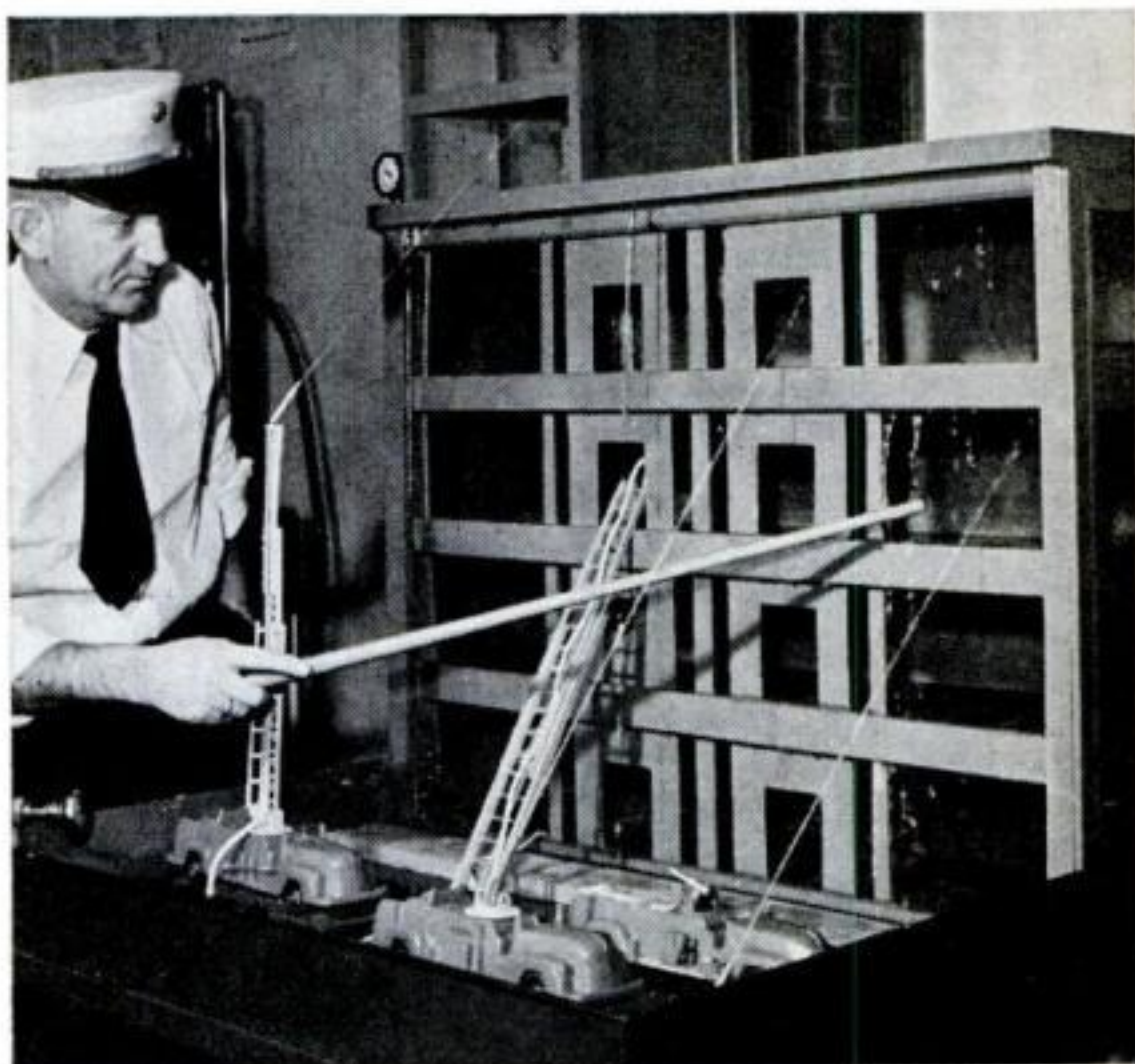


Truck Tests Rotors

THE rotor goes 'round and 'round, but what looks like a hybrid helicopter-truck above won't take off. It's just an old White truck fitted with special rigging to test parts and prove new designs for the Piasecki Helicopter Corp., Morton, Pa. The truck dates back to World War I days.

Toys Train Firemen

Toy engines squirting water on fires set in this miniature building teach firemen of West Hartford, Conn., the right and wrong ways of directing water on a blaze. A sprinkler system drawing water from a tank on the roof is also used. Smoke bombs teach ventilation methods.



6 Zooming out into space, unit safely clears tail of plane. Fins stabilize pod, slow fall.



8 Capsule strikes ground—parachute is automatically released. Unit will float if it lands in the sea.



9 Flier jettisons doors and walks away, or remains inside until rescued. Heater warms men in Arctic.



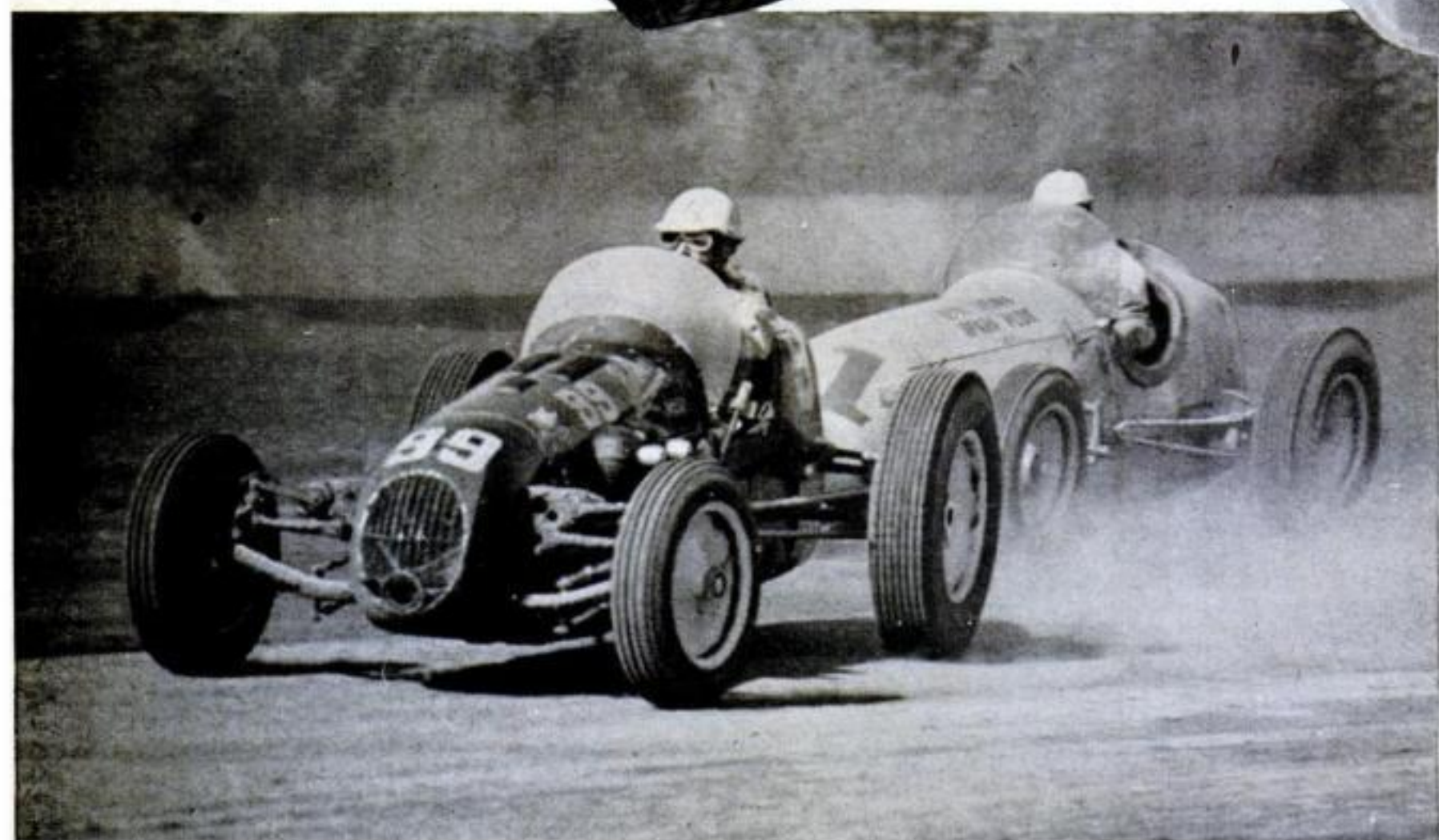
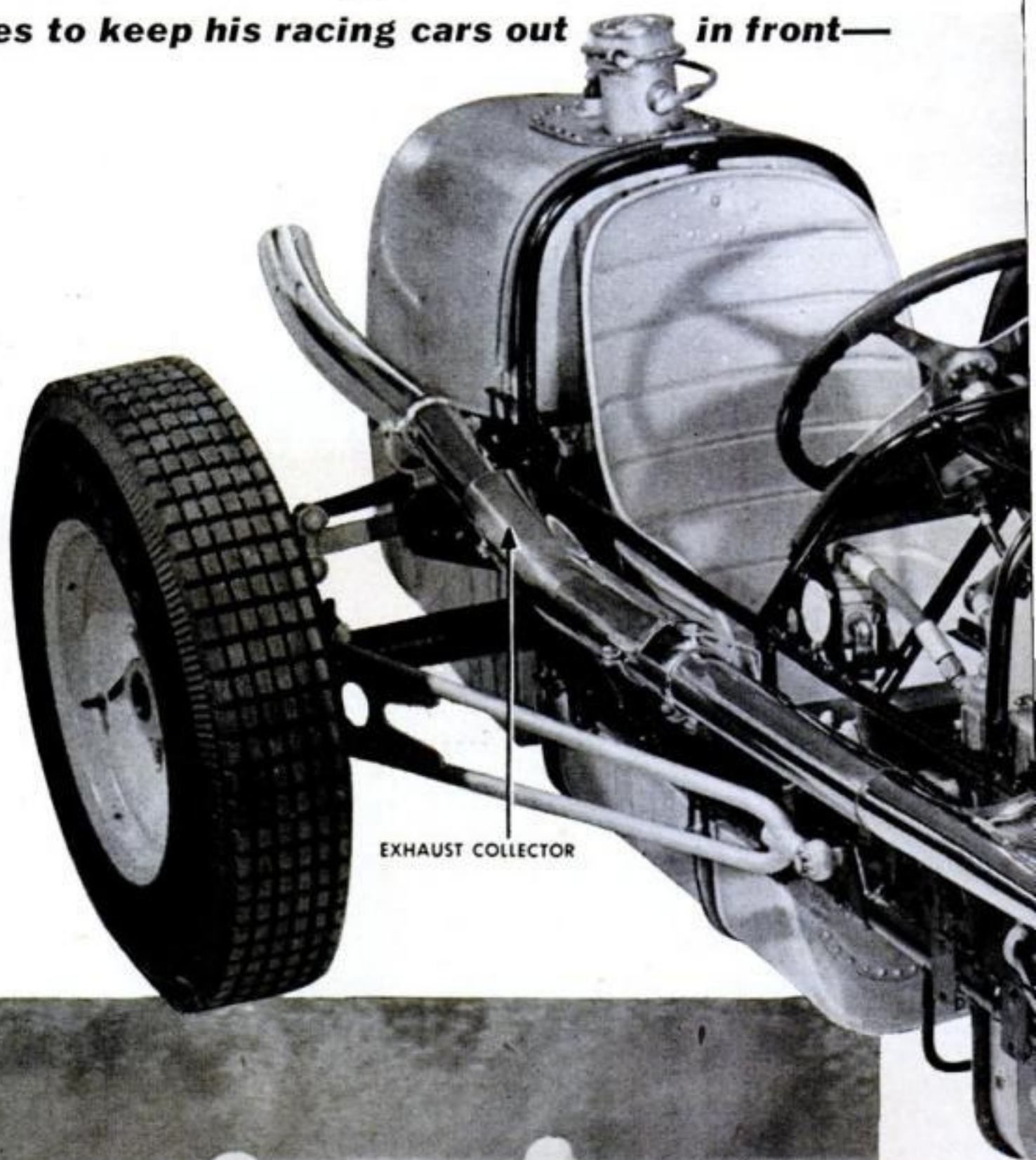
7 Parachute, controlled by barometer, opens to cushion last part of descent.



How Belanger Builds

He has what it takes to keep his racing cars out in front—

BELANGER'S championship racing car, shown with skin off, is a purely functional machine. Its qualifying speed last year was 135 m.p.h.—which meant about 165 on the straightaways. Tires shown here are used only on dirt tracks.



No. 99 rounding a turn on dirt last year. Front wheels are pointed in direction of skid.

Winners



money, yes, but mechanical genius, top drivers and the breaks, too.

**By Devon
Francis**

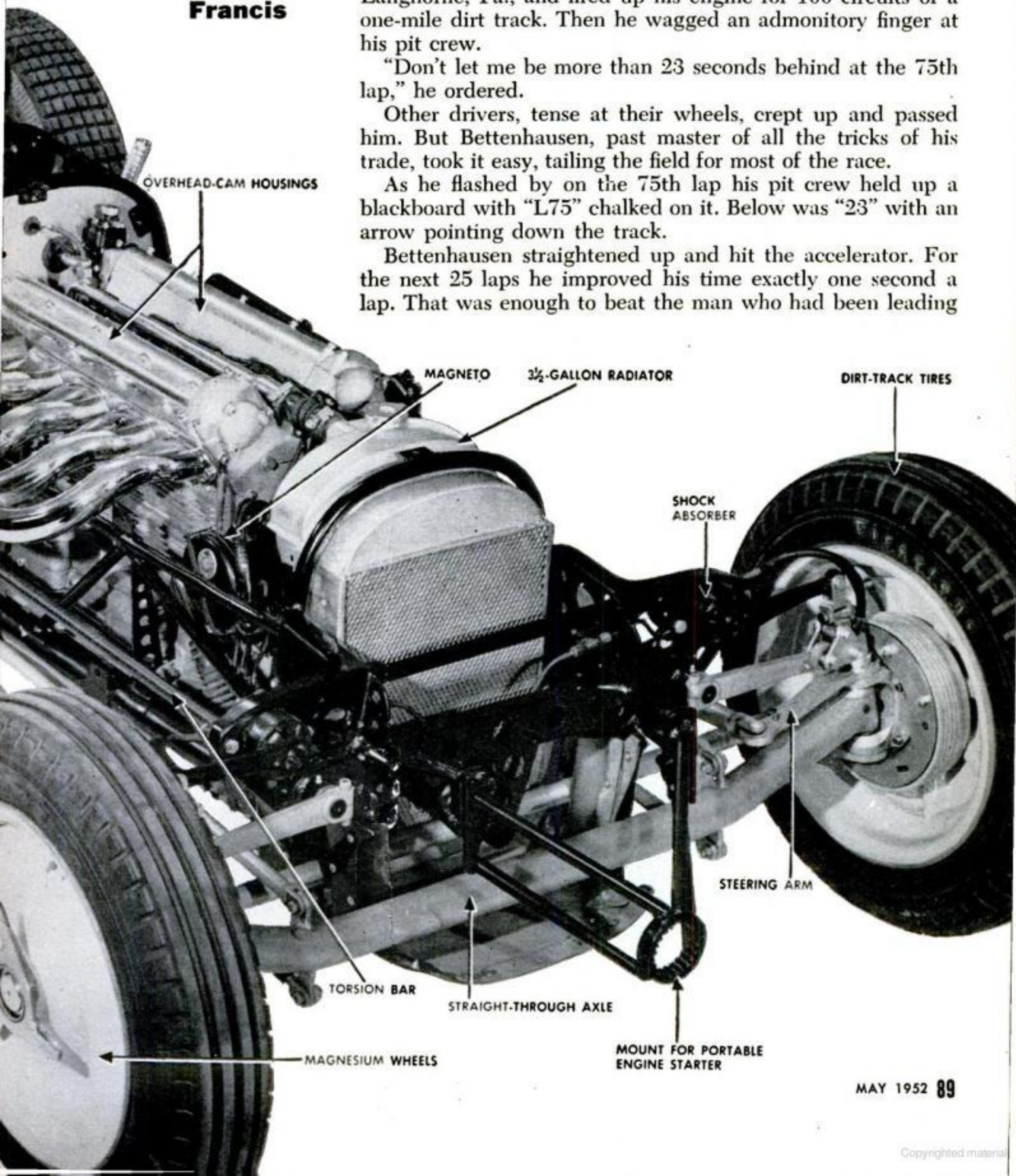
ONE day last summer Tony Bettenhausen, racing driver, shoehorned himself into the cockpit of a tiny mount at Langhorne, Pa., and fired up his engine for 100 circuits of a one-mile dirt track. Then he wagged an admonitory finger at his pit crew.

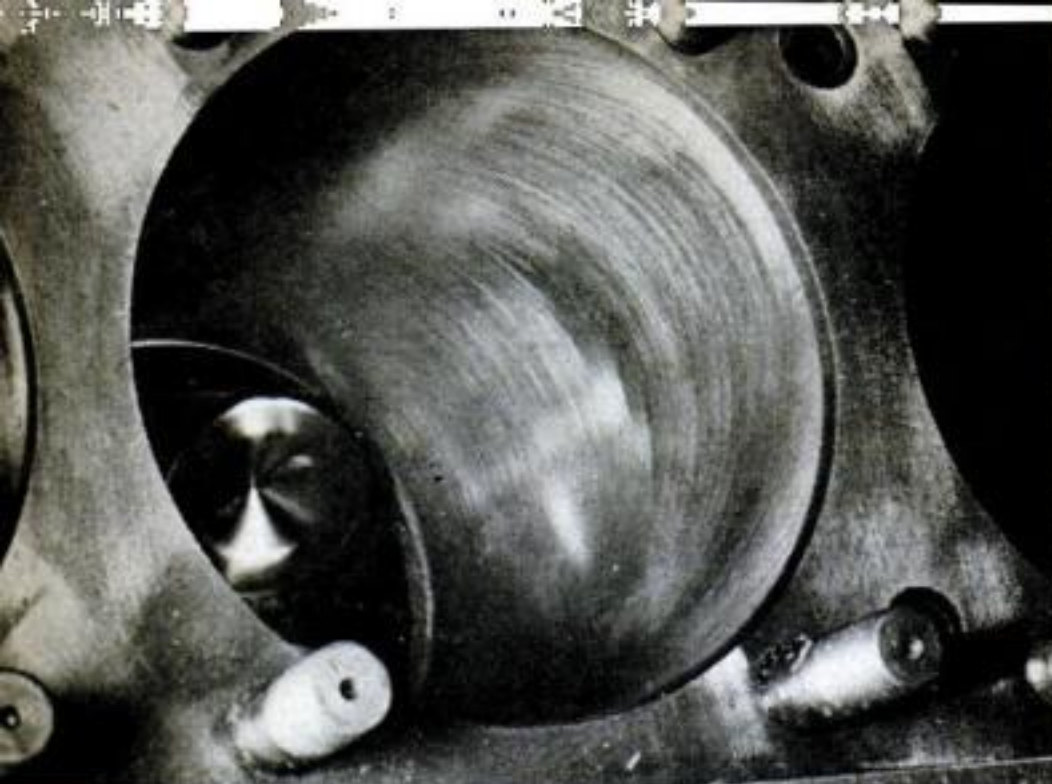
"Don't let me be more than 23 seconds behind at the 75th lap," he ordered.

Other drivers, tense at their wheels, crept up and passed him. But Bettenhausen, past master of all the tricks of his trade, took it easy, tailing the field for most of the race.

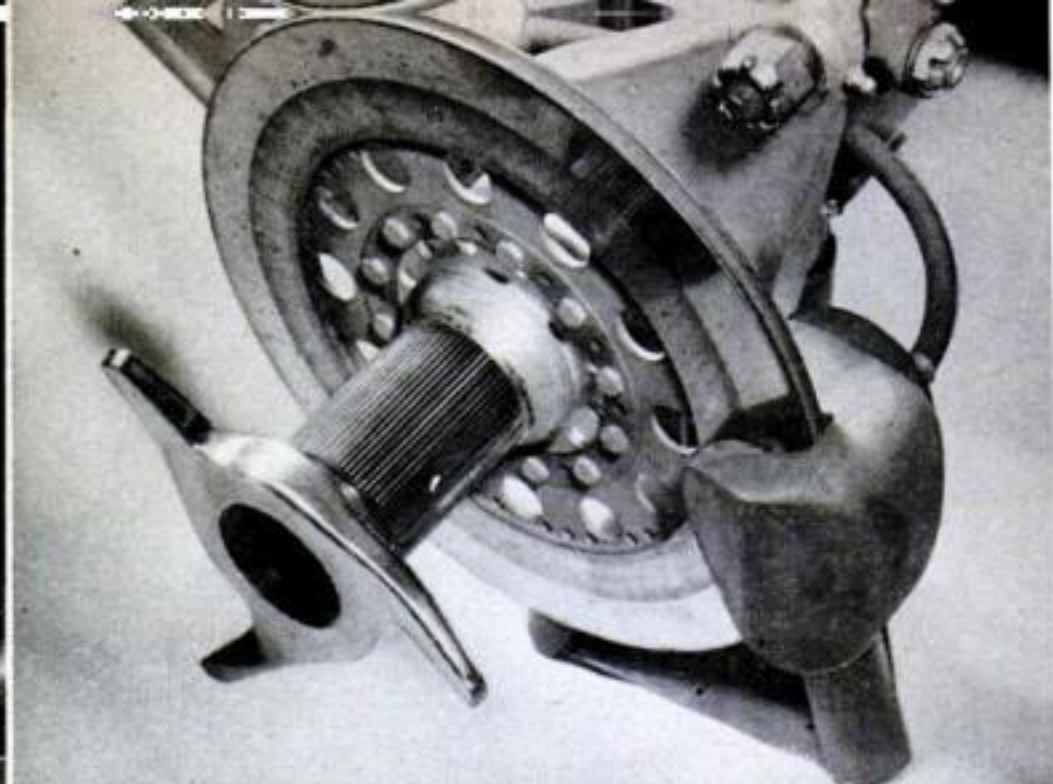
As he flashed by on the 75th lap his pit crew held up a blackboard with "L75" chalked on it. Below was "23" with an arrow pointing down the track.

Bettenhausen straightened up and hit the accelerator. For the next 25 laps he improved his time exactly one second a lap. That was enough to beat the man who had been leading





CYLINDERS are deliberately scratched. This is bottom of car No. 1's block. Unlike conventional cars, racing-car cylinder heads are not removable. Bore is $4\frac{5}{16}$ inches, stroke $4\frac{1}{2}$.



SPOT BRAKES consist of two hydraulic pinchers with linings of two-inch pads that clamp down on iron disk. Brakes are hand-operated. Cockpit has no room for foot brake.

the race—by a comfortable two seconds.

Bettenhausen had confidence in his car—because it was from the most successful stable of racing cars in the United States. This stable, in the drowsy little town of Lowell, Ind., is to professional gasoline racing what Kentucky's Calumet Farms is to horse racing.

Husky, handsome Murrell Belanger, its owner, has spent \$400,000 in the last 10 years on four mechanical blue bloods. His newest car, just arrived, bore a price tag of \$30,000. What Bettenhausen's mount, No. 99, is worth is problematical. Belanger has turned down \$60,000 for it.

No. 99 is the stable's star performer. It won the Memorial Day 500-mile race in Indianapolis last year. Then it carried Bettenhausen to the American Automobile Association national championship on dirt tracks speckled here and there across the country from Langhorne to San Jose, Calif.

With any kind of a fair break, Belanger believes that No. 99 will win again at Indianapolis this month. His newest car, No. 1,

FUEL TANK'S three-inch filler neck, with quick-lock secondary cover, takes 50-odd gallons in 45 seconds. This opening is on left side to avoid spillage on exhaust pipe.



is almost a duplicate of 99. It too has been entered in the 500. One of his other cars, No. 18, holds the world's record for 100 miles on a one-mile dirt track—an average speed of 95.5 miles an hour. And his fourth car, No. 34, holds the world's record for one lap of a mile dirt track, 106.38 miles per hour.

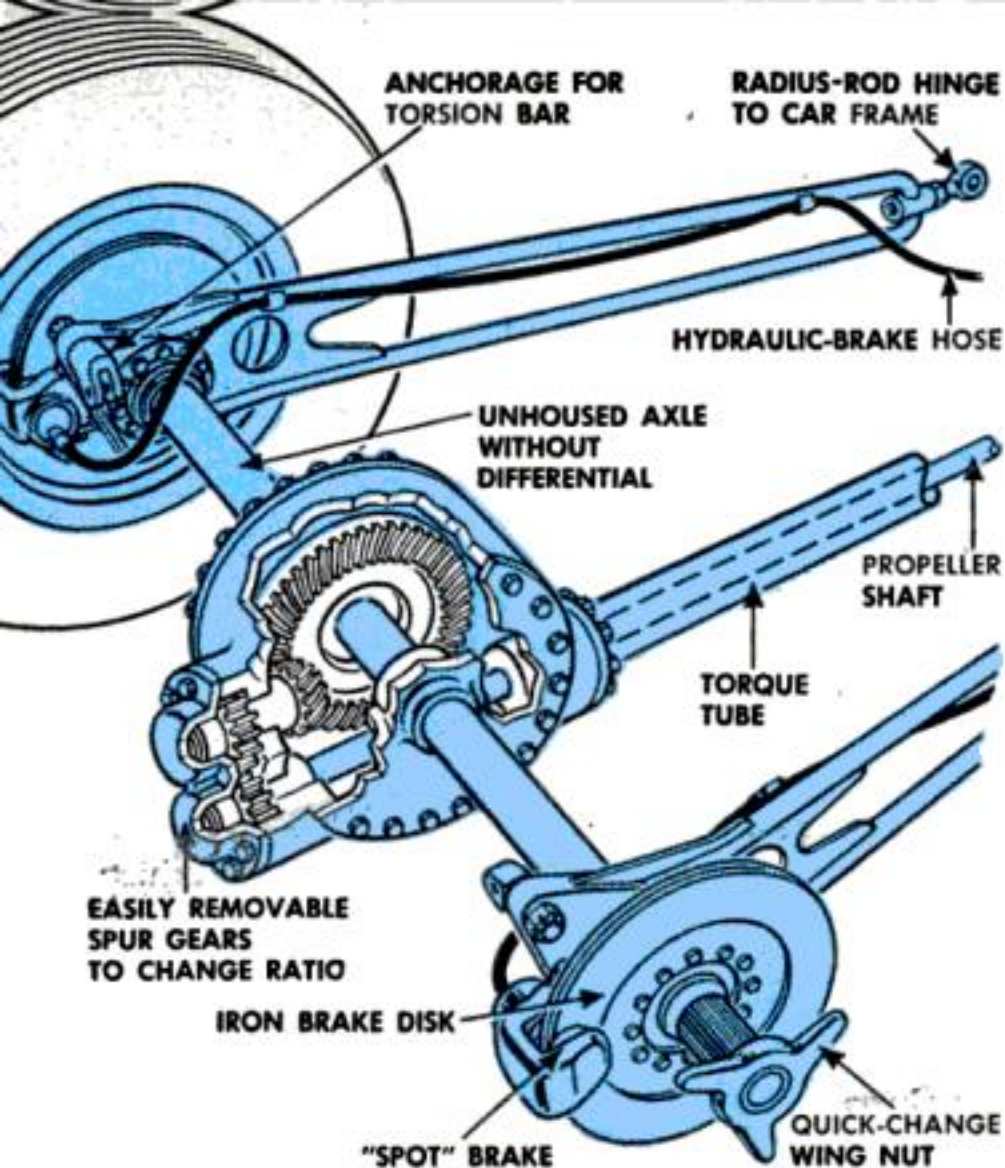
To the unpracticed eye, 99 looks like most other racing cars. It has a Meyer-and-Drake four-cylinder engine, made in Los Angeles, like most of the other cars which compete annually for the AAA championship.

It has a tubular-steel frame and, like the others, a stiff front axle, a one-piece rear axle without a differential, and a three-speed transmission. Its weight is suspended on torsion bars, which is customary, and its brakes are the disk type mounted inboard of the wheel anchorage, which is nothing unusual. Like other racing cars, it has no fan to cool the engine. At track speeds, a fan is superfluous.

Something Extra Added

But the similarities between 99 and competitive cars, like the similarities among horses, are superficial. It has something extra that makes it a championship mount.

It is smaller and lighter than most other racing cars. It weighs less than 1,600 pounds "dry"—without oil, fuel and water. That's half the weight of a Ford, Chevrolet or Plymouth. It's squattier. Its center of gravity is four to five inches lower than ordinary because of the unusual height of the suspension—18 inches in front, 20 in the rear. This is one reason that, while 99 has an unusually narrow tread and has been in four bad



TWENTY DIFFERENT GEAR RATIOS can be mounted on rear axle, which has no differential. To fit track conditions, two spur gears allow variations from 6.41 to 1 up to 3.17 to 1. Two men can make gear change in 15 minutes.

Indianapolis Speedway). For comparison; the Cadillac, the most powerful production passenger car today, develops 190 horsepower.

The exhaust pipe of 99 has a particular diameter and length. Just what they are is strictly Belanger's business. The stable arrived at the dimensions by cut-and-try methods. Diameter and length affect horsepower output.

To own a championship gasoline-racing stable like Belanger's you need an exquisite knowledge of mechanics, a good deal of shrewdness, the breaks of the game, and money. A barrel-chested man of French descent, Belanger has these requisites.

Special Fuel Mixture Used

Last year they all added up to hit the jackpot. Before the 500-mile race on the 2½-mile Indianapolis track, Belanger ran exhaustive fuel-consumption tests on 99. With the mixture determined upon, he figured he would put Lee Wallard, his driver, or "chauffeur," well out in front for a safe lead during the first 200 miles by giving him a light fuel tank—just 30 gallons to start. The car holds 54.

Wallard was instructed to make just one stop, at 200 miles to refuel. With gas consumption of eight miles to the gallon at a speed of 130 miles an hour, he would have a cushion of 16½ gallons for the remaining 300 miles when he filled up at his stop.

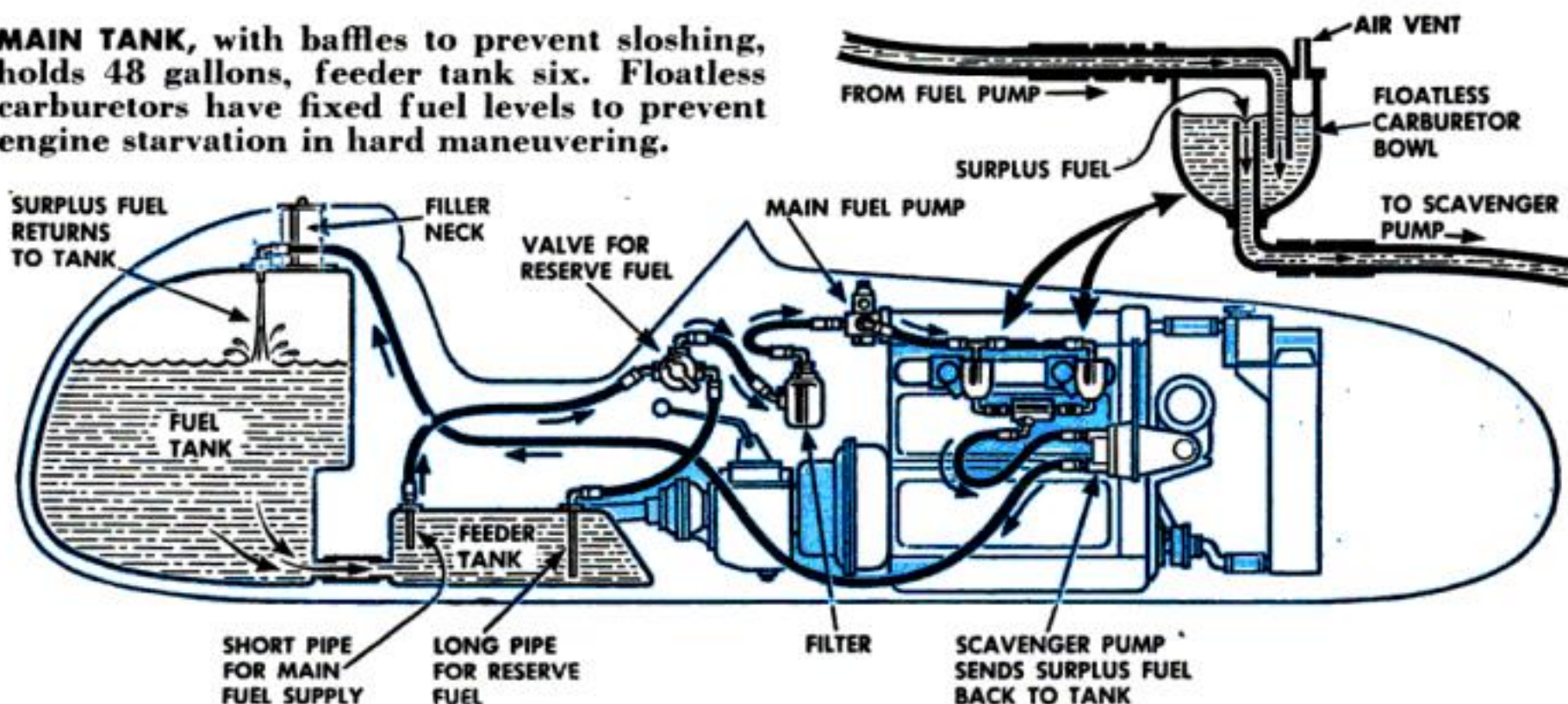
But things went haywire. Instead of 130

crack-ups in its four seasons of racing, it has never been on its back.

"This car," remarks Bettenhausen, "is peculiar. You can't gain time with it by coming out of the chute (the straightaway) fast and throwing it sideways in a corner. You have to drive it differently."

No. 99 has a smaller engine than most racing cars, displacing only 262.9 cubic inches. That's a measurement of its cylinder size. It develops 340 horsepower at a 14-to-1 compression ratio with alcohol (used on dirt because it burns cool when crud from the track plugs up the radiator), and 310 horsepower at a ratio of 11.5 to 1 using Belanger's particular gasoline-alcohol mixture (used on the bricks and asphalt of the

MAIN TANK, with baffles to prevent sloshing, holds 48 gallons, feeder tank six. Floatless carburetors have fixed fuel levels to prevent engine starvation in hard maneuvering.



m.p.h., Wallard drove many laps better than 133. That, Belanger was sure, was going to throw his calculations off. Then, at the 125-mile mark, the blow came. Wallard braked to a stop in the Belanger pit. Two of his tires were going. Belanger groaned.

A quick check of the tank, however, showed that consumption still was only a gallon every eight miles. Mathematically, Wallard could still complete the race without another costly pit stop. As the driver, refueled and re-tired in 75 seconds, threw his car into gear, Belanger slapped him on the back.

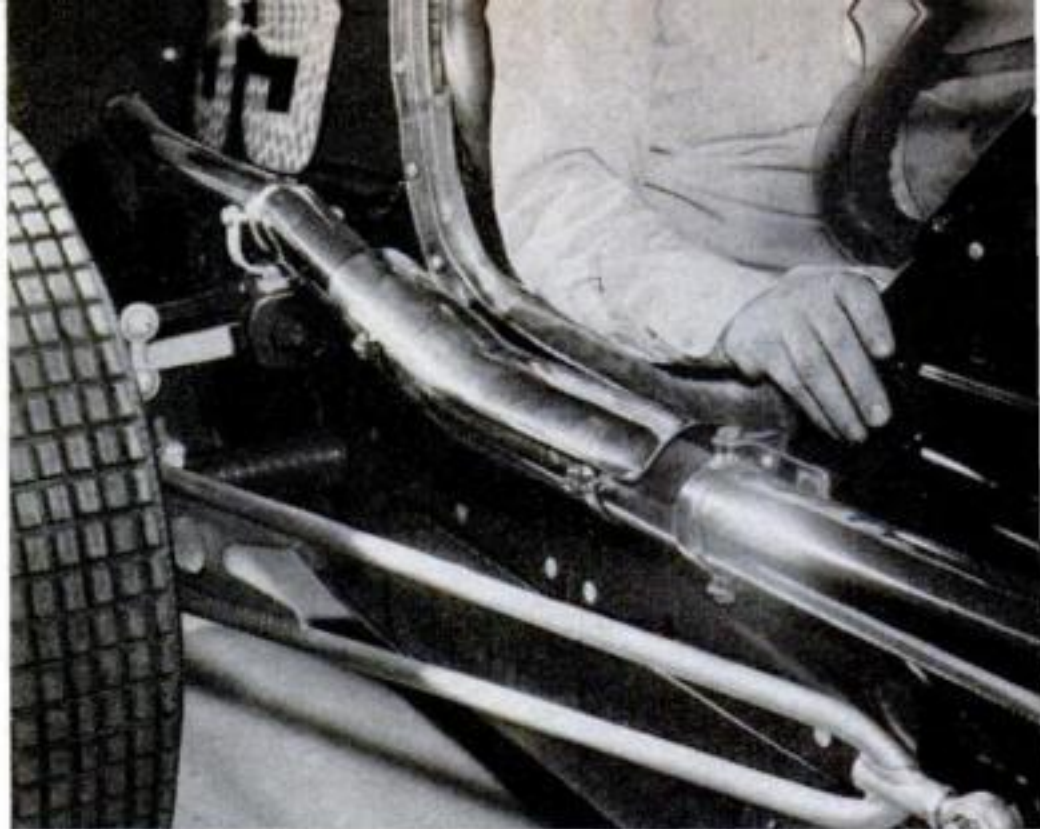
A Winner After 17 Tries

"You've got 375 miles to go and 422 miles of gas," he said over the roar of the cars.

"See you in the bull pen, boss," the chauffeur called back, using a driver's term for the fenced-in victor's circle.

He did. But Belanger was not exactly surprised. He figured from the start that he held the cards—even though he had been unsuccessful in trying to win this race for 17 years.

Merchant and sportsman, Belanger has his own way of doing things. Up to an hour before a race, there's not a drop of fuel put in the tanks of his cars. If he runs up his

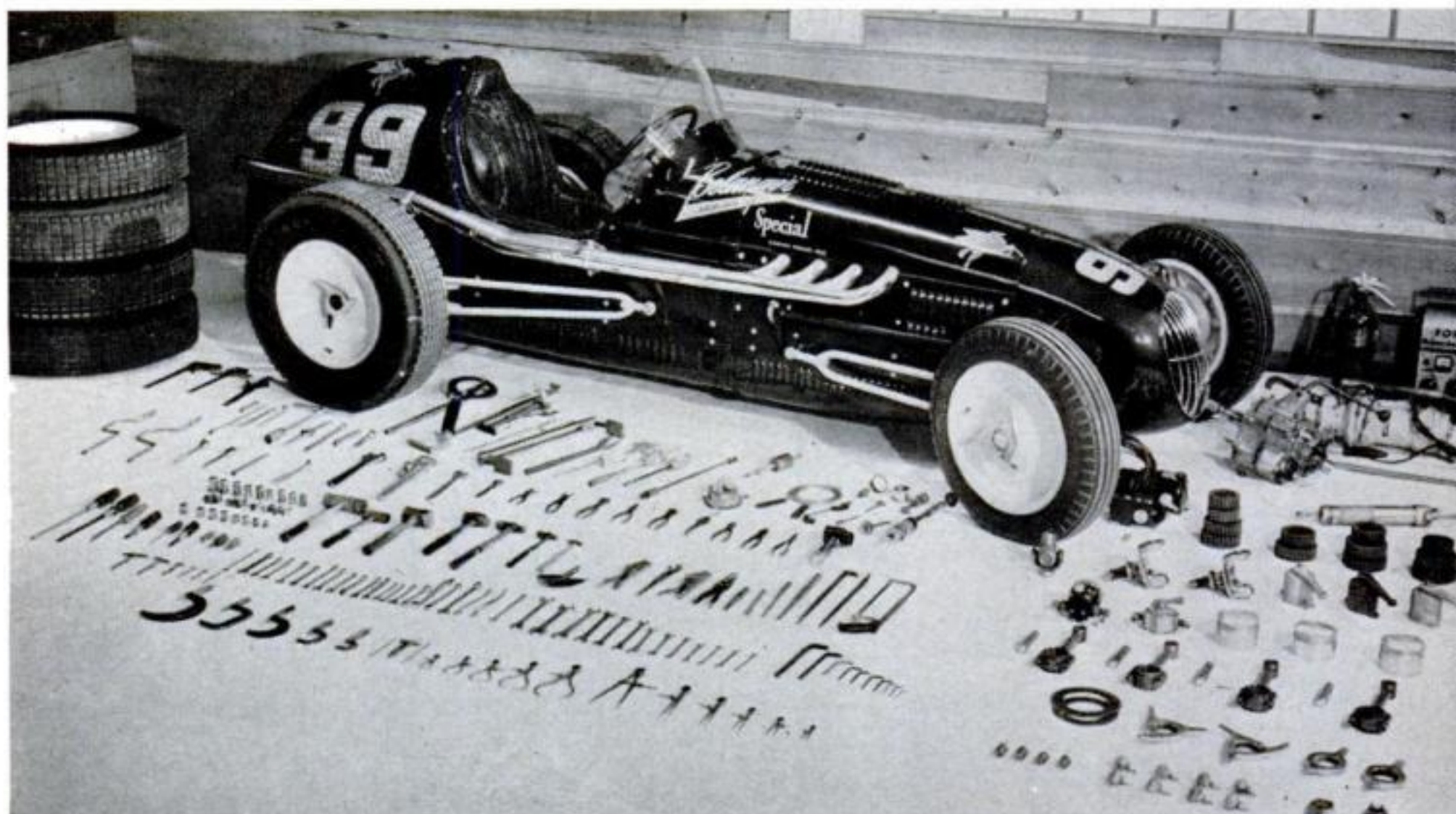


SLEEVE over big exhaust pipe keeps driver from accidentally burning hand. Tread of both No. 99 and No. 1 is 52 inches. Steering ratio is 8 to 1 on dirt, 12 to 1 on asphalt.

engines, he draws fuel from milk cans piped to the carburetors. He says alcohol, one of the fuels used in racing, congeals and dirties his filter screens.

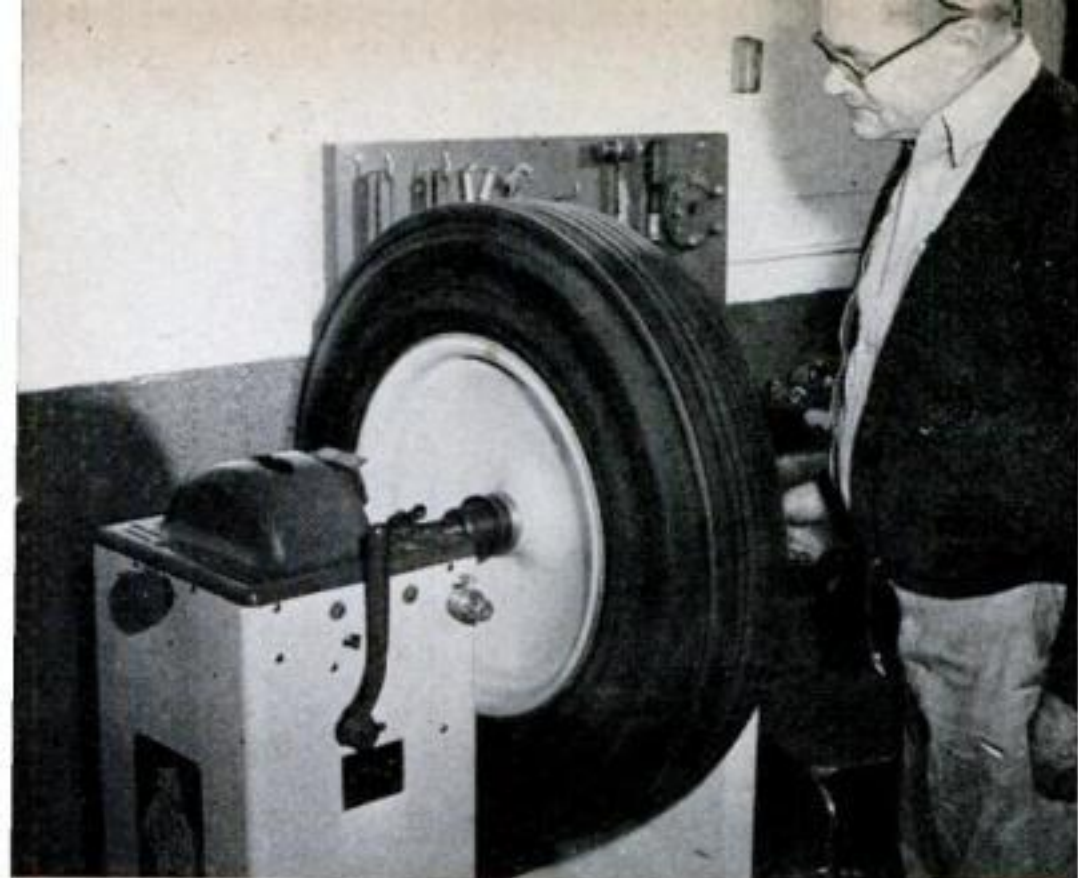
After a race he siphons off every drop of fuel left in the tanks. The nearest his crew ever came to getting fired outright was after a race last year when they failed to empty the tanks.

Belanger has his eye on everything.



THESE TOOLS AND PARTS, plus others not shown, accompany a Belanger car to every meet. Tools include bearing pullers, ring filers and expanders, removers for valve springs

and guides, battery charger, weighing scales, electric cranker. Spare parts include tires, rear-axle gears, magnetos, pistons, spindle arms, clutch plates, universal joints.



BUSS BROWNELL balances wheel in Belanger shop. Championship car's rear wheels are 30 inches in diameter, with 7.00 by 16 tires; front wheels, 26 inches with 5.00 by 16 tires.

"Remember your extra weight in the corners," he will say to a driver at a fuel stop. All racing cars skid the turns—the "corners"—but they skid differently after a refueling because the rear wheels are carrying more. Sometimes a chauffeur momentarily forgets.

Belanger lets his drivers look at the fuel pressure, oil pressure and temperature gauges on their instrument panels when they are "cutting one" around the track for

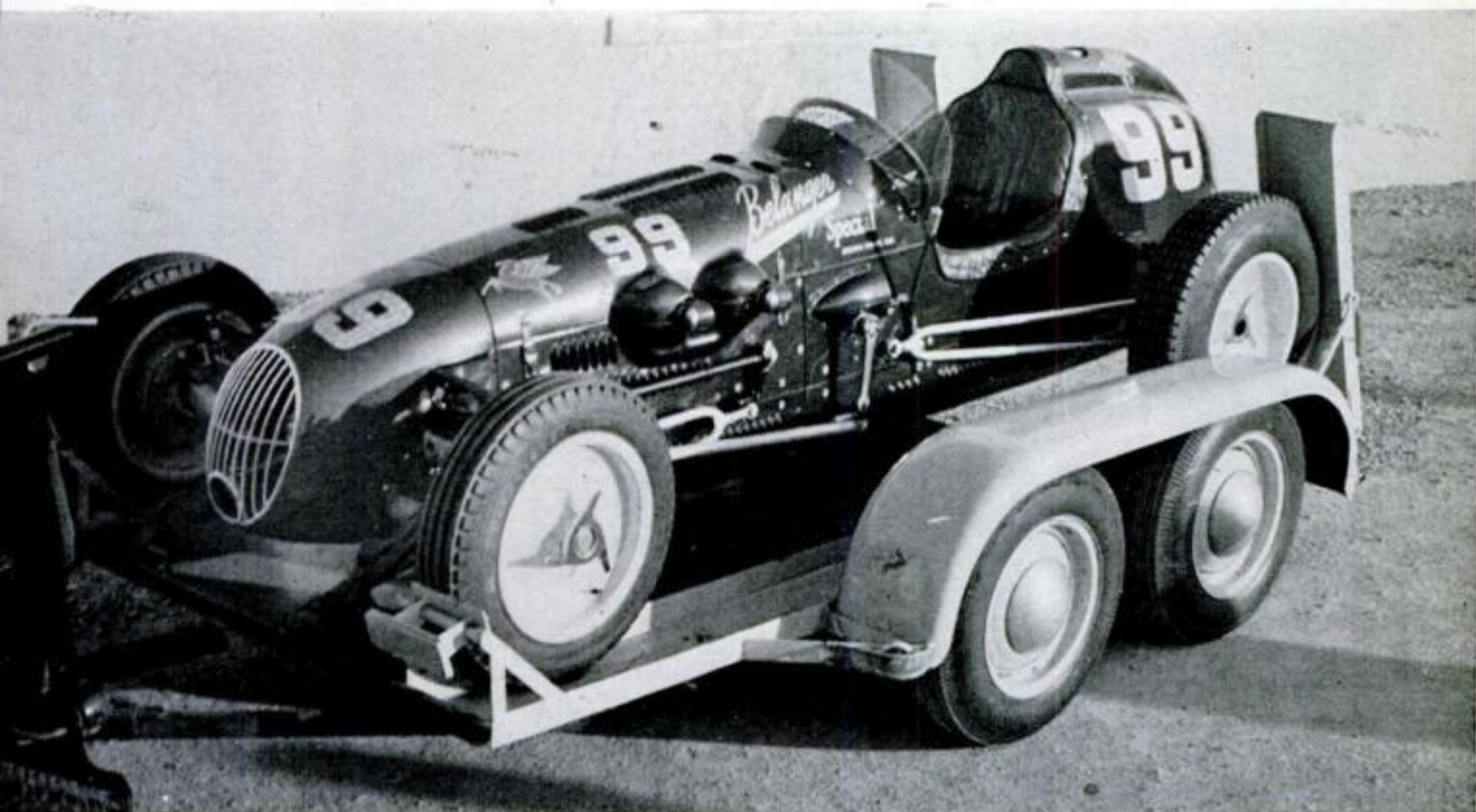
practice. But before a major race he disconnects all the dials. A faulty instrument reading might worry them. He wants them to concentrate on winning.

Most of the between-seasons work on 99 and its sister cars is done at Lowell in a shop that is a mechanic's paradise. It is on the second floor of its owner's farm-equipment store, and a special elevator hauls the cars up and down. One side of the shop is paneled in knotty pine.

Stable a Community Project

Like a small-town baseball team, the stable is a sort of community project. Arrive in Lowell to see Belanger, and within an hour the barber, chief of police and local agent for the Monon railroad know your name and business connection. Earl "Frenchy" Sirois, a competitor of Belanger in the farm-equipment business, will get wind of you, too, because he's one of Belanger's mechanics during the racing season. Lowell's fire chief for the last 16 years, Harold "Buss" Brownell, most certainly will know about you because he's also a Belanger mechanic.

The traffic of Lowell citizens through the Belanger shop starts the day after the racing season closes. That's when the active mounts in the stable are torn down and rebuilt. The



STABLE'S CARS are hauled to races on special trailer. Body and wheel locks prevent movement. Its cargo, No. 99, has a wheelbase of 99 inches, over-all length of 153. Height to top

of headrest is 42 inches. Steering wheel is one piece of chrome-moly steel with rubber cover. Belanger estimates his prize money from 10 years' racing at \$200,000—half his outlay.

1951 season ended on November 11. By December 23, No. 99 had been taken apart and put together again.

When the crew got through, half the car's parts were new. But you couldn't tell them from the used parts. All were spotless and shiny. That's the Belanger touch.

So is the sign on the outside of the shop's

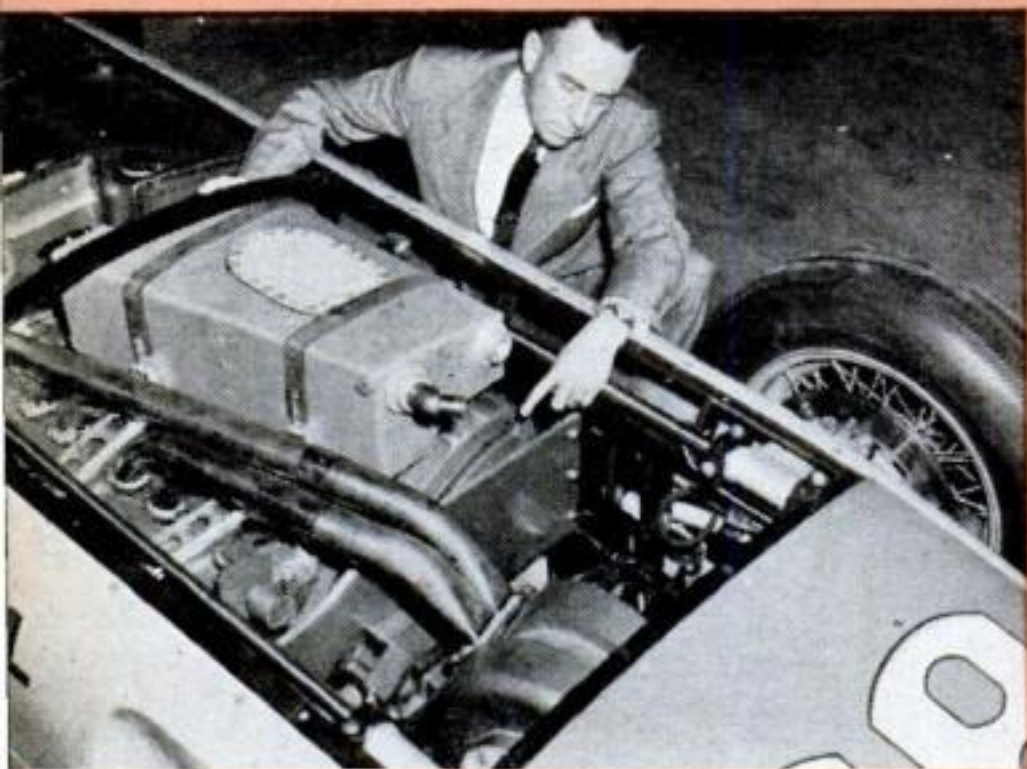
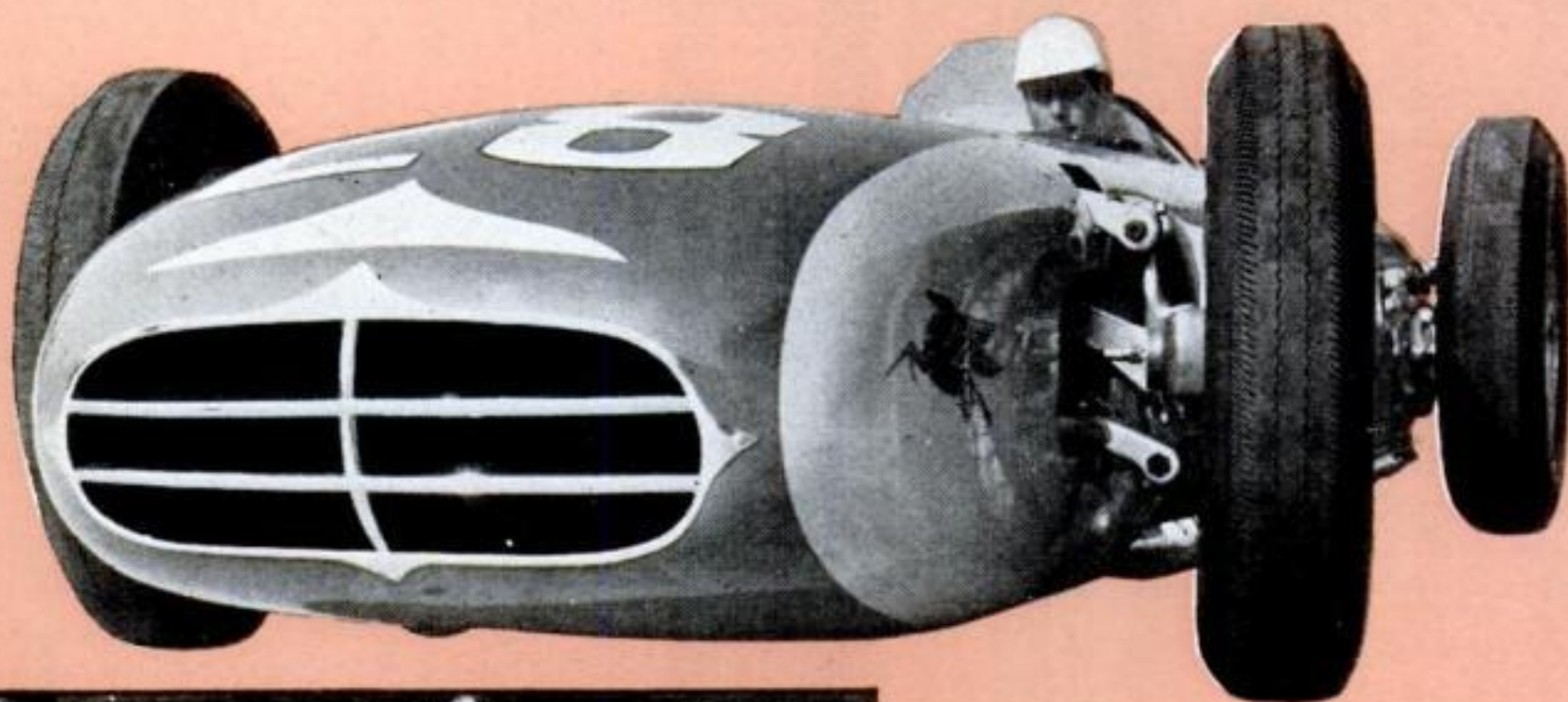
big sliding door. It reads: "Stop—Please Wipe Feet On Mat." You'd better, too.

Belanger has three expert mechanics on his payroll the year 'round. One, Buss Brownell, studied mechanical engineering at Purdue.

"No use looking for a chair," Buss will

[Continued on page 226]

New Diesel Entered at Indianapolis



FOUR-CYCLE ENGINE, with two intake, two exhaust valves for each of six cylinders, develops 345 horsepower. It weighs 800 pounds—300 more than a four-cylinder gasoline racing engine, but 700 pounds less than a standard Diesel of like horsepower.

DIESEL RACING CAR is only 29 inches high at cowl, several inches lower than usual. This is third car produced by Cummins Engine Co.,

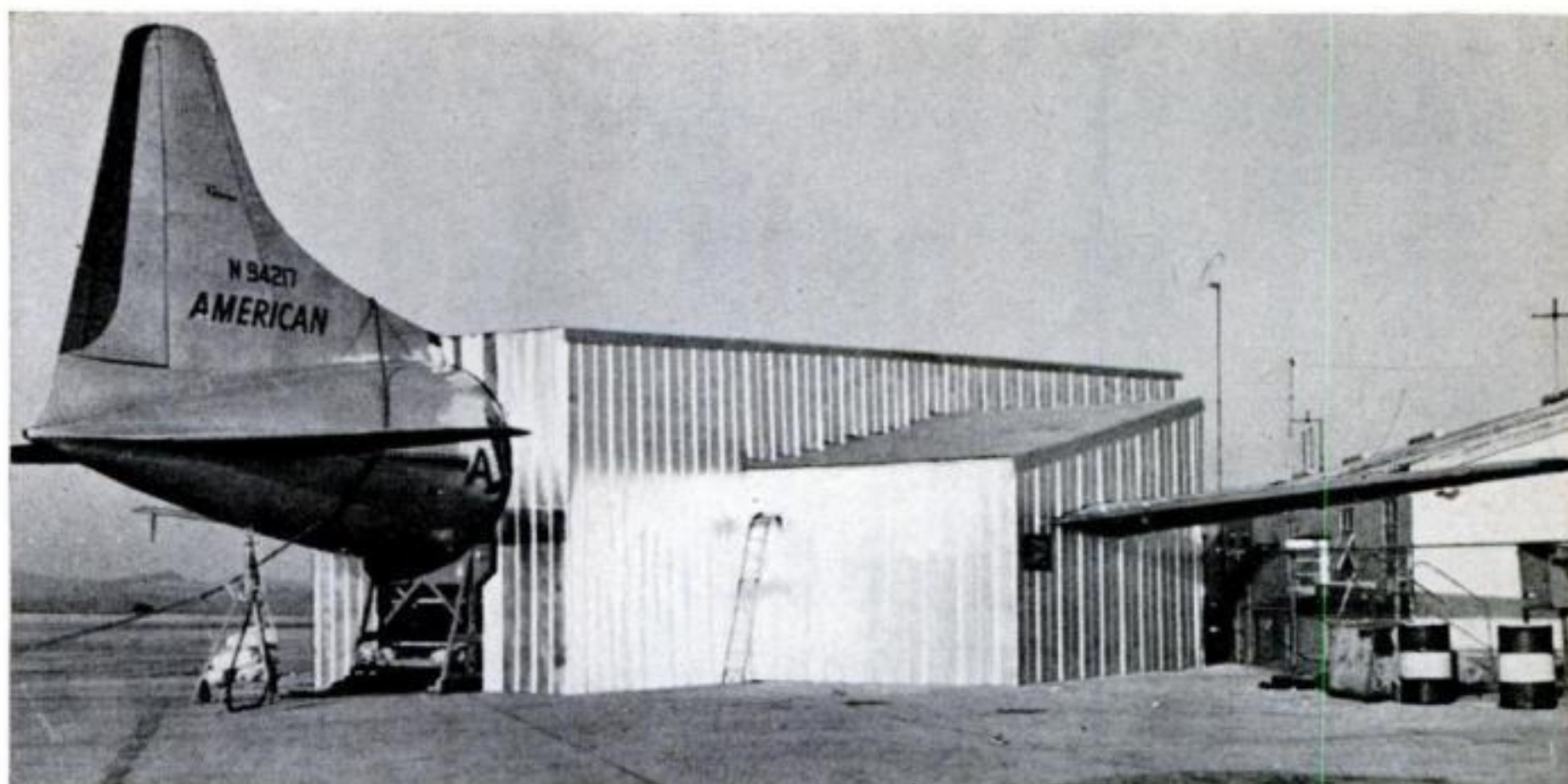
A DIESEL-DRIVEN car, with its drive shaft running down the left side, will be seen this year on the Indianapolis Motor Speedway. It is the newest version of the ignitionless Cummins race car.

The engine, which burns standard Diesel fuel, is "pancaked"—it lies on its side and the pistons work horizontally. Because of the position of the drive shaft, the driver sits in a well on the right side of the car.

The Cummins is several hundred pounds heavier on the left side than on the right. Since races are run counterclockwise, the right side is on the outside of the turns. The Cummins' odd weight distribution is supposed to equalize the pressures on the tires—imposed by centrifugal force—in the turns and make them wear evenly. Racing cars normally wear out their right tires faster.

Columbus, Ind., to be entered in 500-mile race on competitive basis. Last year's entry qualified at 135 miles an hour.





It Has Wings, But Can't Fly

WHAT looks like a flying garage in the photograph above was the answer to a repair problem worked out by an American Airlines maintenance crew. The aluminum

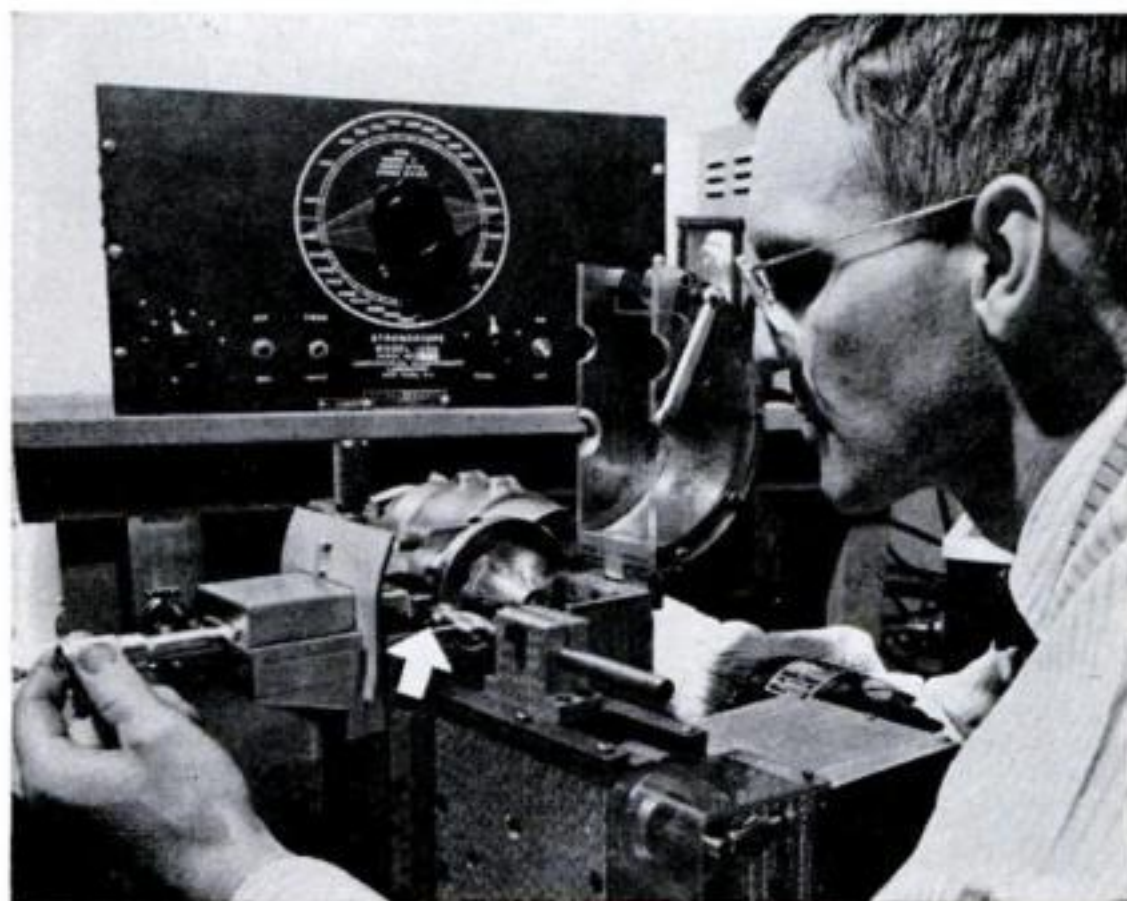
structure was built around the plane to permit repair work in midwinter at an airport that had no hangar facilities. The Convair suffered damage to its nose gear during a landing at Charleston, W. Va.

Tire Grippers Brake Truck

"ATTENTION! Emergency Brake. Stops in 5 meters." So reads the sign on the German truck at right—a warning that its newly developed friction brakes will stop a heavy truck, going 30 miles an hour, in a little more than five yards. Braking, according to the Frankfurt inventor, is accomplished by four curved metal shoes slamming against the rear tires. They are hydraulically operated by the driver.



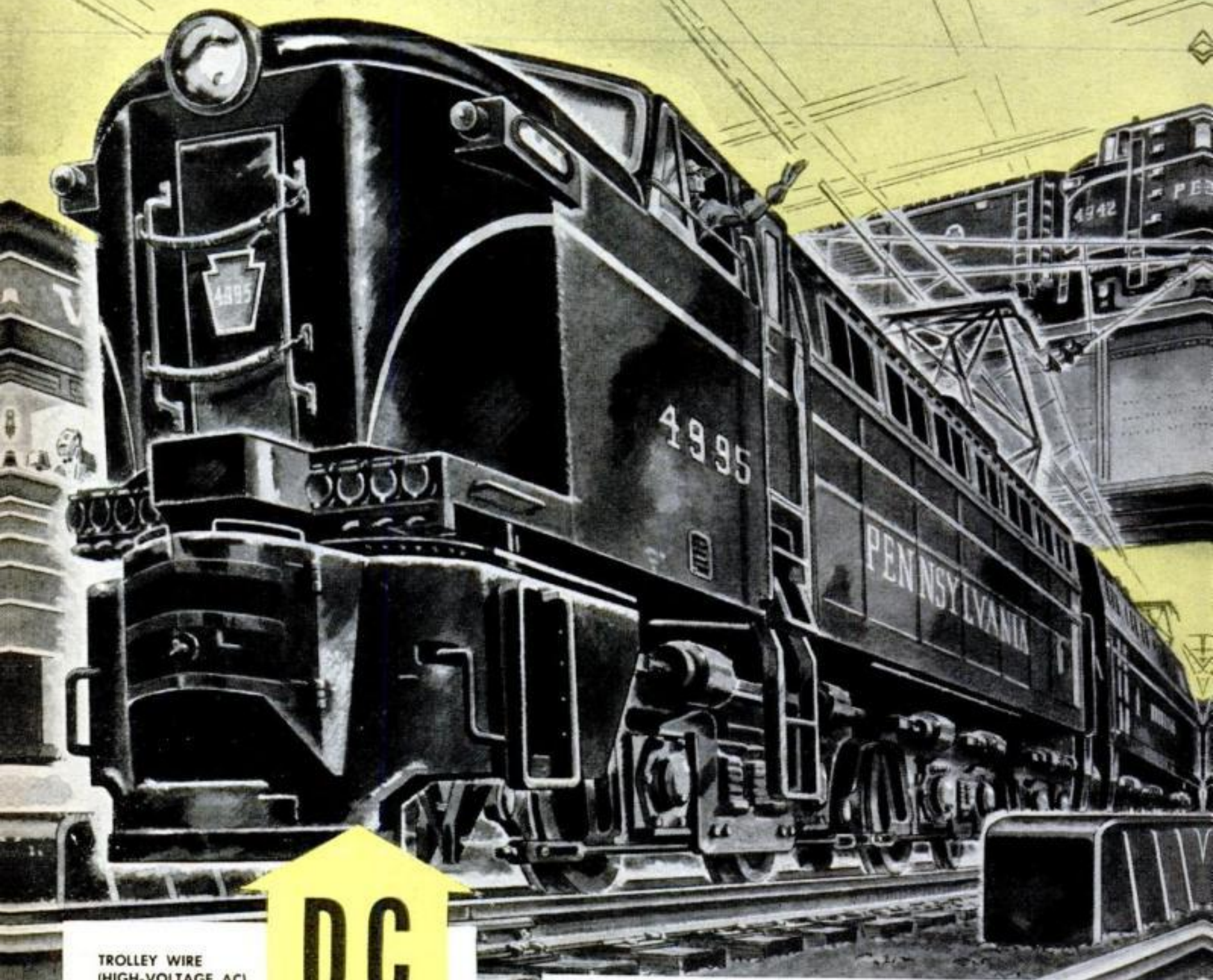
Supersonic "Wind" Cuts Its Way Through Samples of Metal



A "CUTTING WIND" in the microtome at left really slices thin. Used to produce sections of metals and minerals—invisible to the naked eye—for laboratory study under an electron microscope, it has cut a shaving less than two-millionths of an inch thick, or 1,000 times thinner than a human hair.

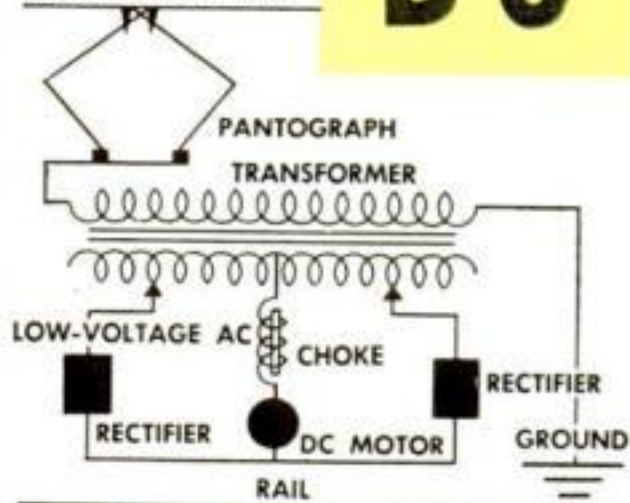
Dr. E. F. Fullam, GE scientist who designed the instrument, believes that the cutting is done when the material is torn by a pocket of compressed air produced just ahead of a knife blade spinning at more than 818 miles an hour.

DC Battles AC to Pull the Heavy Loads



DC

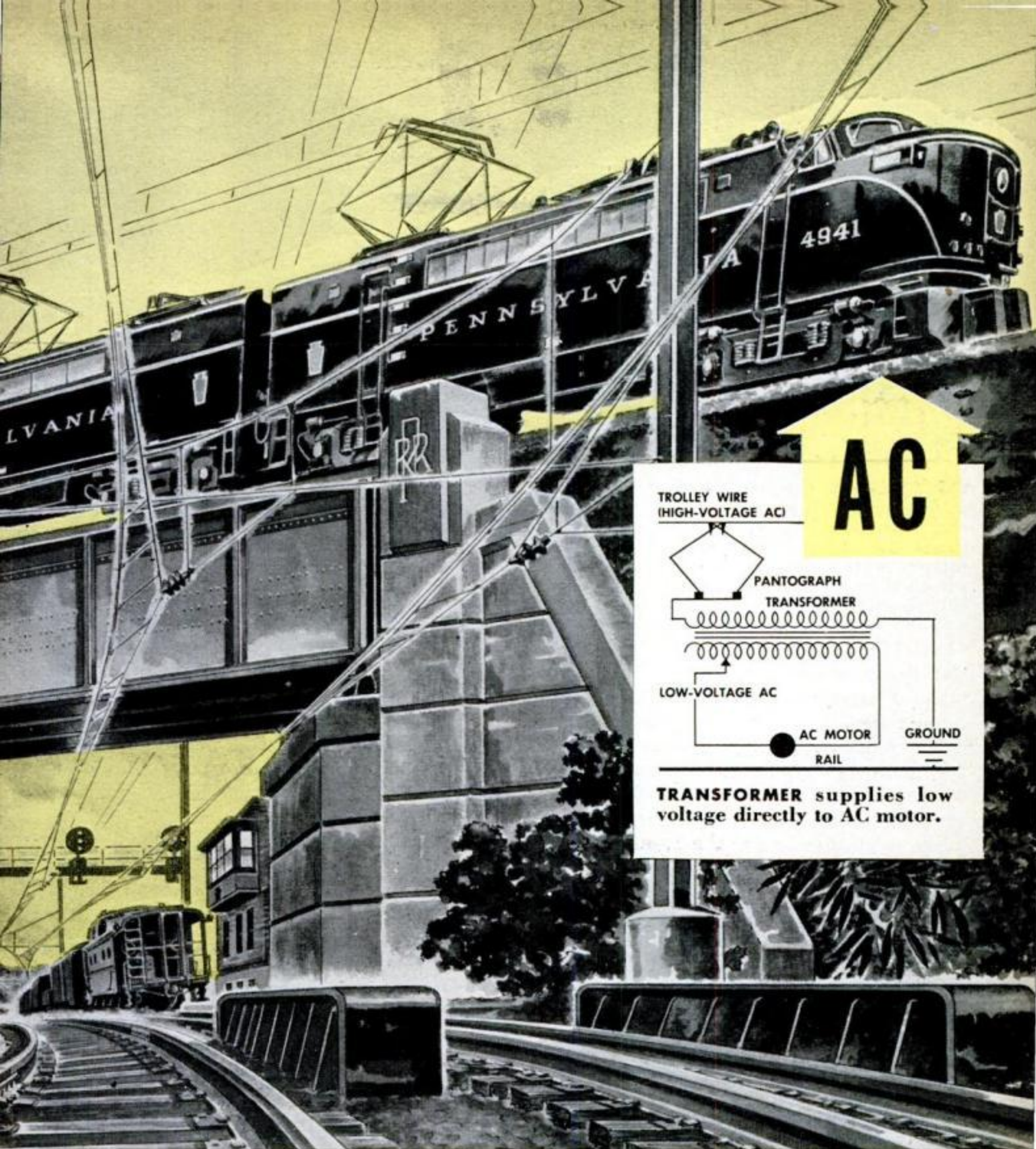
TROLLEY WIRE
(HIGH-VOLTAGE AC)



RECTIFIERS convert low-voltage AC to run DC motor.

***Two new electric locomotives
—one radical in design, one
conventional but souped-up—
are trying their muscles on the
world's busiest high iron.***

By Henry B. Comstock

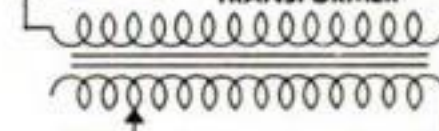


TROLLEY WIRE
(HIGH-VOLTAGE AC)



PANTOGRAPH

TRANSFORMER



LOW-VOLTAGE AC

AC MOTOR

GROUND

RAIL

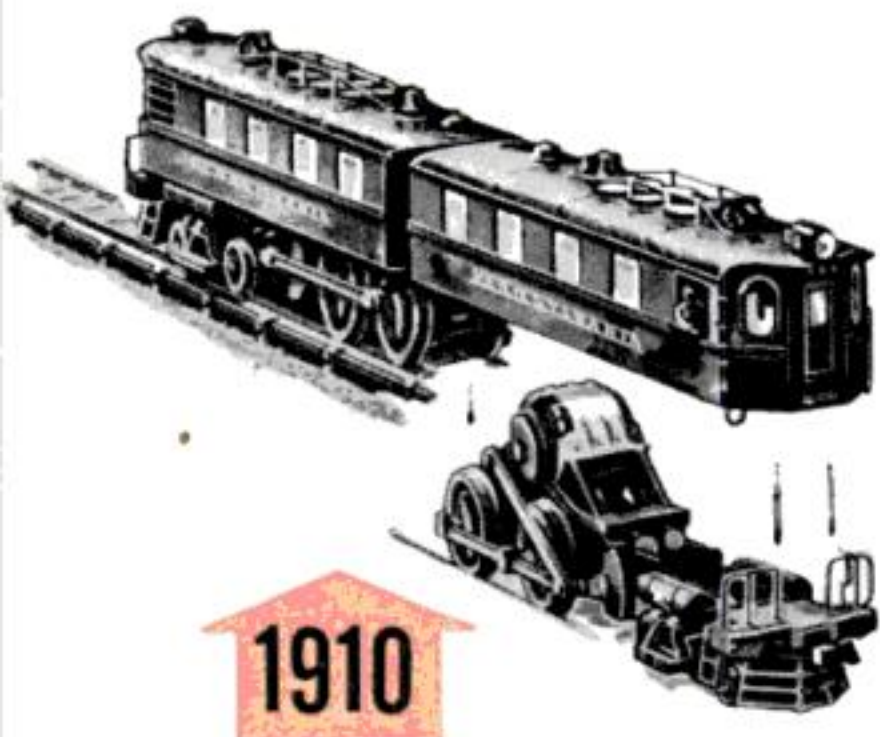
TRANSFORMER supplies low voltage directly to AC motor.

I HAVE just hit the cinders in Waverly Yard, near Newark, N.J., after 16 hours spent high in the cabs of two giant electric locomotives now undergoing tests on the Pennsylvania Railroad. The trip was about as cozy as a slow slide down a staircase in a vacuum cleaner. But I wouldn't have traded my head-end rides on these big freighters for all of the comforts of the Super Chief.

This was more than an engine ride. It was a ringside seat at a million-dollar scrap be-

tween the topflight engineering talent of the two greatest names in electric traction—Westinghouse and General Electric. Out of it may well come a super-performance, low-cost-per-horsepower engine which will give electric railways a powerful shot in the armatures. It may even lead to new electrification projects, a development that the experts have considered as unlikely as a return of the cowcatcher.

There has been no "me too" approach to



EARLY ELECTRIC, the DD-1, had a single 2,000-hp. motor in each cab. Too large to fit between the engine frames, the motors were coupled to the wheels through jackshafts and side-rod rigging.

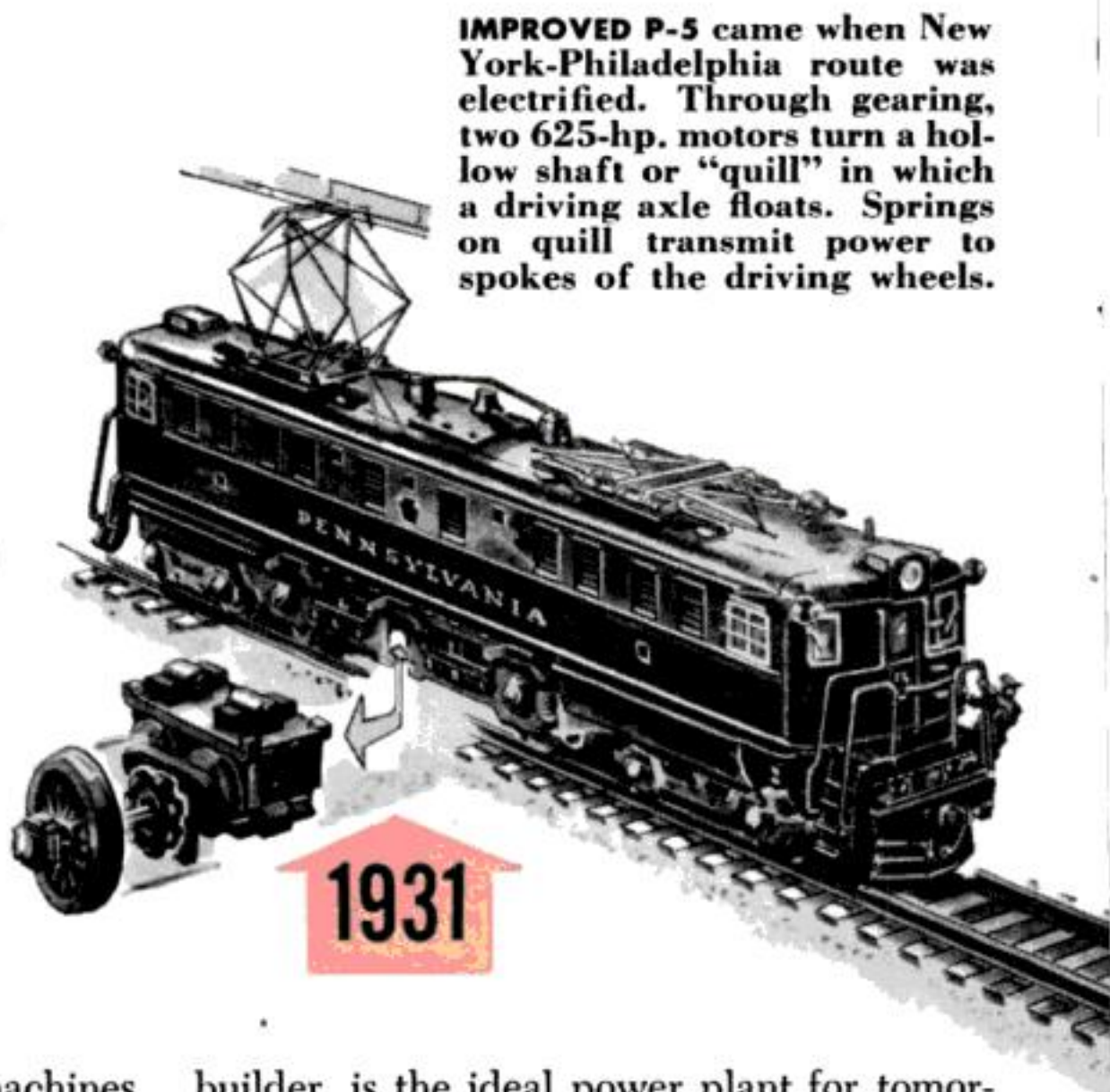
the design of the experimental machines which I have just seen slugging it out on the busiest section of high iron in the world.

The Westinghouse product is revolutionary. It leeches alternating current from the overhead wires, shoots it through king-size versions of the rectifier tubes in your own radio set, and delivers the resulting direct current to its traction motors. The theory is simple. AC is superior to DC for power transmission. Today it times the heartbeat of 269 locomotives bearing the Pennsylvania's keystone insigne. But direct-current driving motors are inherently more powerful than AC motors in the low-speed ranges. So, in its new freight engine, Westinghouse has combined the advantages of both AC transmission and DC motors.

Seeking the Perfect Power Plant

The General Electric engine, on the other hand, is evolutionary. Here there has been no radical departure from tried and proved alternating-current design. Instead, the accent is on improvements to existing apparatus and the engineering of a husky AC traction motor intended for low-speed operation. No attempt has been made to pack spectacular horsepower into a single cab. Rather, General Electric intends its engines to be coupled together in multiples of two, three and four, to meet the demands of individual trains.

Each locomotive, in the opinion of its



IMPROVED P-5 came when New York-Philadelphia route was electrified. Through gearing, two 625-hp. motors turn a hollow shaft or "quill" in which a driving axle floats. Springs on quill transmit power to spokes of the driving wheels.

builder, is the ideal power plant for tomorrow's freight train. As to which of them is right, your guess, at the moment, is almost as good as the Pennsy's. If you would like to size up the situation, come along with me to Harrisburg, Pa., and make the test run for yourself.

There, in the Enola Yard, you will find Westinghouse locomotive No. 4995-4996 waiting for you—124 feet of green-black powerhouse, grumbling softly to herself. But for the diamond-shaped pantographs which have already stretched to lazy contact with the trolley wire overhead, you'd mistake this big white-coaler for a Diesel.

Special Crew Takes Over

In spite of the bright 11 a.m. sunlight, it is a bit chilly down on the ground and you welcome a blast of electrically heated air as you climb into the cab.

There is as much official brass in that operating compartment as there is copper in the control cabinets behind it. Assistant Electrical Engineer S. V. Smith is stowing his grip in the crew locker. Once out on the road, he will check every click of the massive throttle against a battery of gauges under the big safety-glass windshield. Sprawled comfortably in a bucket chair in front of Smith, Road Foreman of Engines D. E. Schlegel explains the operation of the dynamic brake to Engineer H. C. Williamson and W. J. Fletcher, special duty engineman,

Maryland Division. Fireman J. H. Hall is downing black coffee from a Thermos. Beside him a stocky young fellow in a checkered hunting cap is doing his multiplication tables on a slide rule.

"Meet Sandy Ames of Westinghouse," Smith shouts into your ear. "This is Sandy's baby. Don't let him sell you a bill of goods."

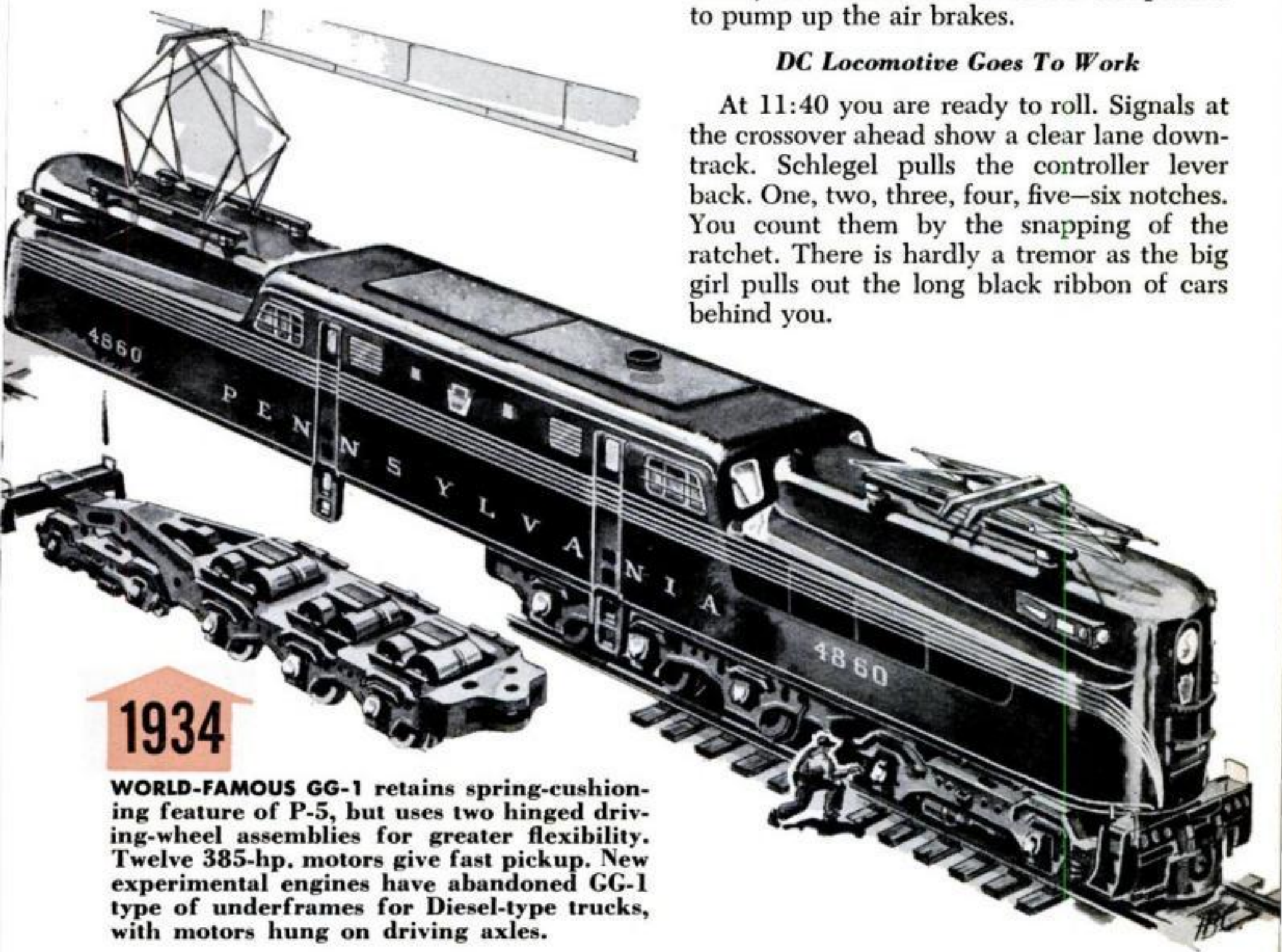
Sandy grins at the Pennsy engineer. "It's your locomotive now."

the yard office. One hundred and thirty-nine cars; 14,980 tons!

Ebaugh takes your ticket (you need one even to ride a freight engine) and drops back to the ground. The road foreman of engines flips the reverse lever, and his left hand closes over the throttle. There is a sharp click and a couple of hundred feet of rail slide noiselessly away from the snout of the engine. You make an unseen coupling with your train and wait for the compressor to pump up the air brakes.

DC Locomotive Goes To Work

At 11:40 you are ready to roll. Signals at the crossover ahead show a clear lane down-track. Schlegel pulls the controller lever back. One, two, three, four, five—six notches. You count them by the snapping of the ratchet. There is hardly a tremor as the big girl pulls out the long black ribbon of cars behind you.



WORLD-FAMOUS GG-1 retains spring-cushioning feature of P-5, but uses two hinged driving-wheel assemblies for greater flexibility. Twelve 385-hp. motors give fast pickup. New experimental engines have abandoned GG-1 type of underframes for Diesel-type trucks, with motors hung on driving axles.

"And your reputation," Smith cracks back.

Between them, they brief you on the run: "Two units. Six power trucks; 12 driving axles; 44-inch wheels. One 600-volt DC motor geared to each axle. Same motors used on Baldwin and Fairbanks-Morse road Diesels. Total horsepower: 6,000. Combined weight of the two locomotive units: 755,000 pounds. Explain rectifier tubes later.

"Our train, today—a solid coal job: Altoona to Baltimore. Don't know tonnage or number of cars yet. But she ought to be a lulu."

It turns out that she is. Conductor J. E. Ebaugh brings the glad news forward from

All eyes are fixed on the instrument panel as you weave past the tower that marks the end of the yard and the beginning of a two-by-two march of massive trolley poles to the east. There are more than 27,000 of these steel H beams along the electrified route linking New York, Harrisburg and Washington, D.C. You will follow a comparatively level line skirting one of the most scenic reaches of the gray-green Susquehanna.

Ames calls attention to another kind of beauty; the effortless starting characteristics of these DC traction motors. He says that it would have taken five 2,000-horsepower



HEART OF DC ENGINE is bank of rectifying tubes called ignitrons (cylinders at bottom of cabinet above), which convert AC from power lines into DC for motors. Previous DC engines carried AC motors to run DC generators which powered DC driving motors. Ignitrons weigh one-fourth as much as such equipment, have no rotating parts to be serviced.

Diesel units to do the same job. This seems a bit out of line with the 6,000-horsepower rating of No. 4995-4996.

"Horsepower" Is a Deceptive Term

Horsepower, however, is not the complete yardstick in freight-locomotive performance. Tractive effort, or the actual pulling power developed at the wheels is equally important. And that is where the trolley-fed DC motor shines. In the case of the Diesel, the horsepower rating refers to the output of the internal-combustion engine which turns the generator—not to the train-hauling power. Actually a 6,000-horsepower Diesel provides only 4,800 horsepower to pull its train. The rest is lost in electrical conversion and in the demands of auxiliary apparatus. The rectifier, or *ignitron* locomotive, as Westinghouse calls it, suffers no such losses and therefore shows a substantially higher tractive effort through its entire speed range. Also, it can draw upon an almost limitless supply of trolley-fed electrical energy for temporary overloads that the Diesel, which must generate its own power, cannot.

Beyond the Pennsylvania Turnpike overpass, the roadway spreads to four tracks and the big gray controller lever beats a fast tattoo as Schlegel pours on the kilowatts. Smith taps you on the shoulder and points

to a large hydroelectric plant down-river. "Safe Harbor," he shouts. "They've got 25-cycle water wheels. Feed us direct."

Ames isn't missing a trick.

"That doesn't mean a thing with these motors," he points out. "We can use 60-cycle just as well. That's another ignitron advantage—AC traction motors need 25-cycle, so 60-cycle commercial current has to be converted before they can use it. Discourages railroad electrifications."

In This Corner—the Ignitron Tube

Ames is now ready to exhibit the pint-sized wonder that makes a traveling substation of 4995-4996. He opens a steel door at the rear of the operating compartment and you find yourself in a long corridor full of the roar of giant blowers. Talk is impossible, so you fall back on sign language. Passing up all of the conventional equipment, Ames takes you to the feature attraction, a cupboard-like cubicle with six steel containers, arranged like jars of jam, on a well-protected shelf. These are the ignitrons, mercury-filled vacuum tubes which change the AC from the wires into DC for the motors. A handful of raised fingers indicates that there are four such groups aboard this two-unit locomotive. Each motor, then, uses two tubes; one to shoot power into it when the alternating current is traveling in one direction, the other to carry on the good work when the current reverses itself. The result of this "two-cylinder" pump action is a nearly smooth flow of DC which is leveled off still more through husky chokes cut into the circuits.

AC Challenger Enters the Ring

You have just seen one bid for the rubber-insulated Golden Gloves. Now it is time for some road work with General Electric's AC contender. It doesn't have quite the breadth of shoulder of the Westinghouse DC job. The combined weight of its two units is 491,000 pounds; their over-all length, 108 feet six inches; the horsepower rating, 5,000.

The unlimited supply of power from the trolley wires—which lets you overload the motors—combined with 48-inch wheels, makes for fast acceleration. So does Engineer W. N. Gillespie of Perryville, Md., who has running rights over four divisions, and intends to make use of them. He gets out of Baltimore at 9:31 shoveling in the white coal so fast you'd never guess that you had

[Continued on page 270]



ELECTRIC WATCH on man's wrist (left) is prototype of model that will later appear on market. Near-microscopic size of motor is illus-



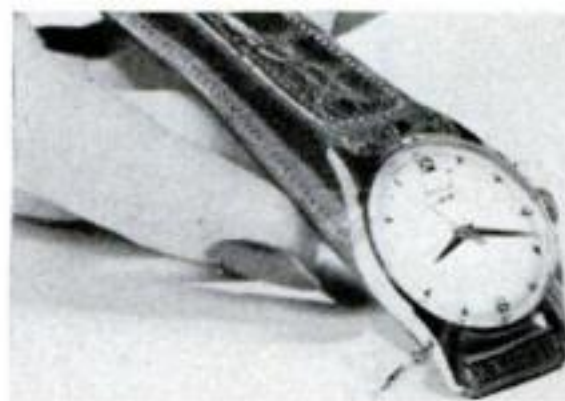
trated by experimental field coil for it (right), wound with 3,000 turns of insulated copper wire only 1/6 as thick as human hair.

You Won't Need to Wind This Battery-Powered Wrist Watch

ONE of these days you'll tell time by an electric wrist watch, according to a leading maker who plans to put one on the market. It will never need winding and will keep even better time, it is said, than the finest spring-driven counterpart.

A laboratory-built prototype, first of its kind, has been assembled and is illustrated here. Inside it, a battery smaller in bulk than a penny runs it for more than a year and may then be replaced. The motor, a masterpiece of engineering in miniature, is built to comparable scale.

No conventional electric-clock movement could possibly be scaled down to such small size, so research by the maker, the Elgin Na-



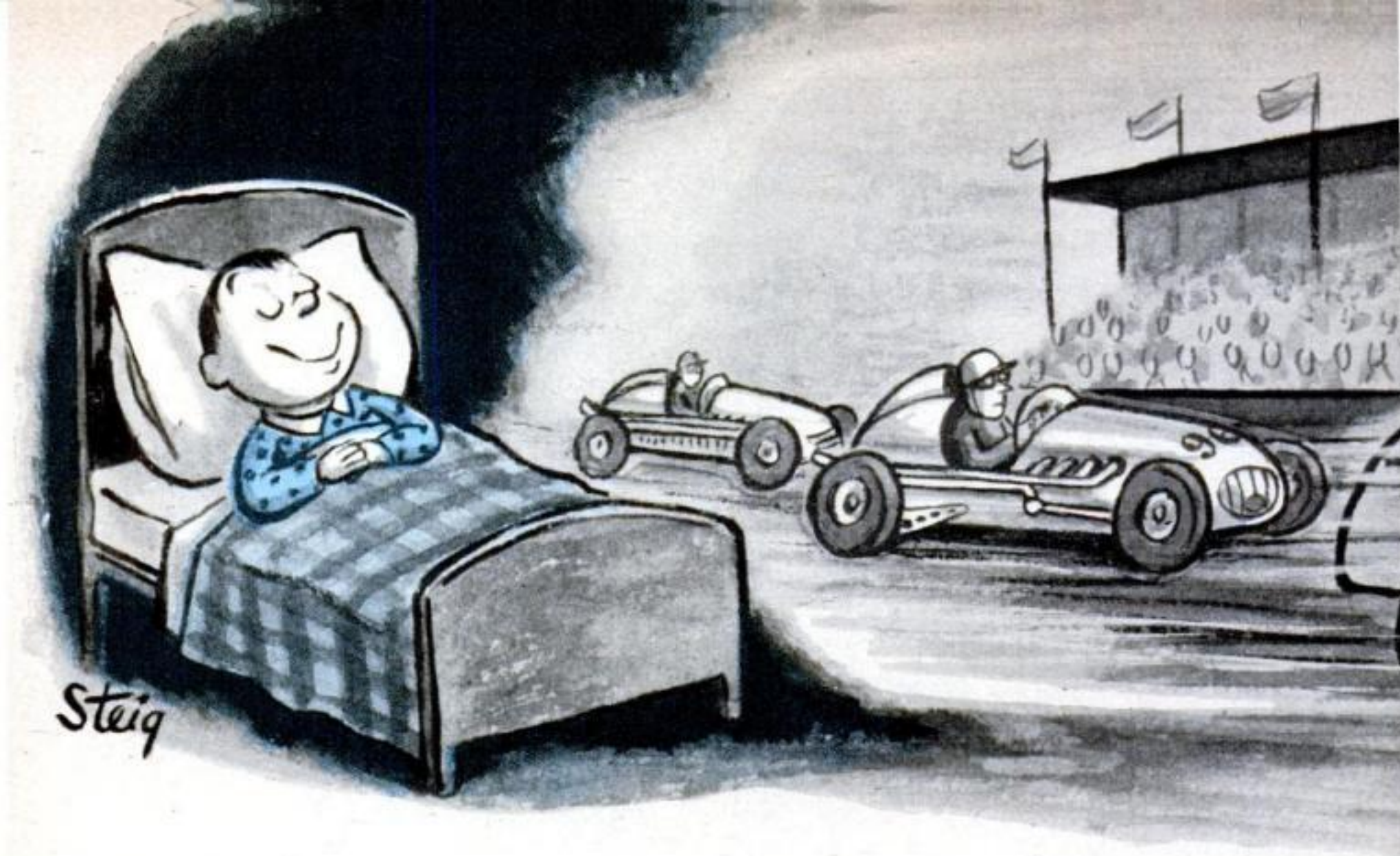
TINY BATTERY, represented at right above, takes up less space than a penny. Battery runs electric watch for more than a year.

tional Watch Co., had to start from scratch. The resulting "watch of tomorrow" is called "probably the greatest single advance in the science of watchmaking" since the 15th Century invention of the mainspring, with which it dispenses.

German Sports Car Looks Like Airplane, Hits 125 M.P.H.



You don't step into this new German sports car—you climb in through the roof. Instead of doors, it has two airplane-like cockpit hatches that are hinged at the top to swing up. Intended primarily for racing, the two-seater Daimler-Benz 300 SL is expected to reach a top speed of nearly 125 miles per hour. Its relatively small six-cylinder engine, with a displacement of only 183 cubic inches, puts out 175 horsepower.



The boy speed demons are battling it out for a crack at the All-American Derby title at Akron. But today's streamlined

By Carl Konzelman

REMEMBER those wonderful automobiles you used to make as a kid—a soapbox nailed to an old plank, rolling on wheels swiped from a broken-down baby buggy? If you haven't looked one over lately you're in for a surprise. The cars are still called soapbox racers, but the 1952 model looks as much like a soapbox as a Jag resembles a piano case. They are long, low, streamlined, polished. And the kids work over them with the anxious care of Briggs Cunningham tuning up his latest.

The way the kids race is just as different. No more bumping down a hilly street, dodging traffic and hollering at the cops. The boys have special tracks of their own these days, complete with grandstands, electric timers and photofinish cameras. When they gather in Akron this August for the All-American Soap Box Derby, there will be all the crowds, ceremony and excitement of the Memorial Day classic in Indianapolis.

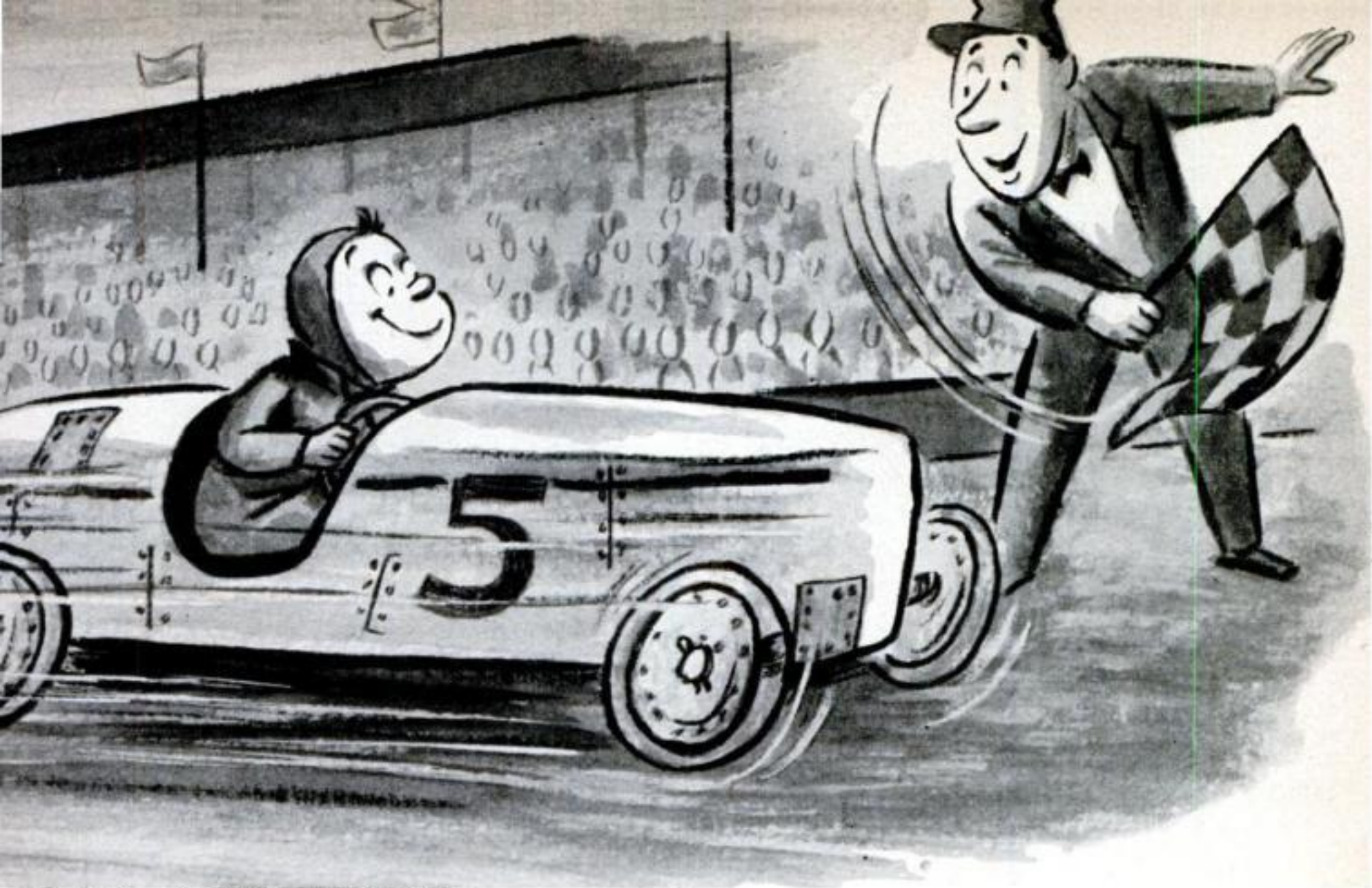
In fact, the excitement is already starting.

In 150-odd communities all over the country, some 50,000 kids are hitting the big time in elimination races sponsored by local newspapers. By the time the final winner has received his gold cup before 70,000 roaring fans at Akron's Derby Downs, between three and four million people will have taken part in the racing program as competitors, officials or spectators.

Boys Build Cars Themselves

The kids love it. If they had their way, their racing cars would be even fancier than they are now. But officials of the Derby struggle to keep the entries simple, cheap and safe. All boys must build their cars without help; the over-all cost, excluding wheels and axles, must not exceed \$10; and designs are limited to those that are stable and easy to control.

Despite strict rules, the ingenuity of American boys is hard to stifle. Metal springs, for instance, are barred as too difficult to make and too expensive to buy. Yet springs still show up on Derby entries—tennis



racing cars have come a long way from that old soapbox.

balls or sponge rubber floating in pairs of jar tops, or hickory boards sprung against each other.

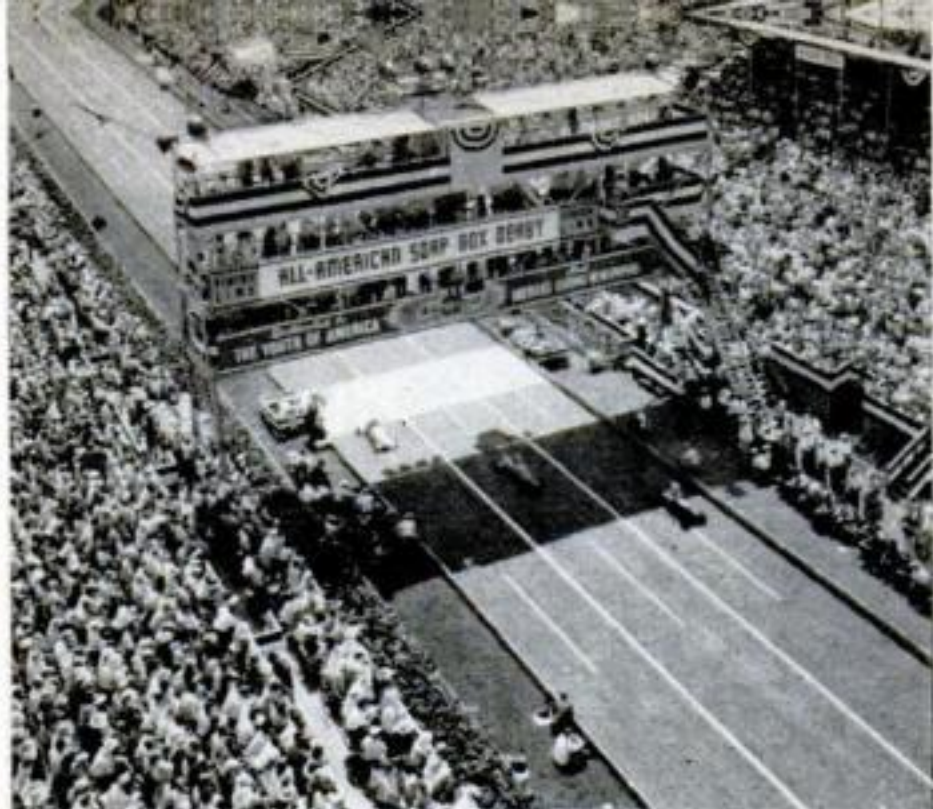
Or take brakes. The rule book is pretty specific. Only a foot brake can be used, because cars weave when drivers let go the wheel to grab a hand brake. The brake must stop the car in a straight line, and its single grab must be faced with tire treads or the equivalent and have at least nine square inches of contact area. But strict as these limits are, improvements creep in. One Detroit entry last year had a hydraulic gizmo to give surer, more even braking.

It met specifications and got by. A lot of other bright ideas have been outlawed, however. One year a boy from Indiana built a body that he could shift forward over the wheels as he approached the finish line, figuring that it might gain a few valuable inches in a close race. Today this wouldn't be allowed.

A lot of streamlining has been barred, too. The boys used to build special windshields, fins, enclosed cockpits. All of these, together



DRAWING NUMBERED CUBES determines lanes in which these heat winners will race in next round of All-American Soap Box Derby. Three cars run in each heat up to semi-final round.



THREE-DECKER BRIDGE straddling finish line carries photofinish camera, officials, newspapermen, cameramen, radio and TV reporters. Above, three cars have just crossed line.



AT STARTING LINE, each car is rolled gently against a baffle plate, held on head of heavy shaft beneath track. At signal, baffles drop together, releasing cars, and timer starts.

with prone driving positions, are now out.

The kids have developed a lot of theories on streamlining, but one fact stands out. Slim and simple silhouettes, looking like a canoe from above, beat all other designs in the Akron finals. This has confounded some auto experts who claim that streamlining has little or no effect at speeds under 35 m.p.h. Today's Derby racers run at 30 or under. (At one time speeds climbed to around 50, but officials clamped down.)

Dry Ice Cools Tires.

Streamlining is only one factor considered by the young builder-drivers. A favorite theory is that the heavier the car and its driver, the faster it will go. But John Valenti, a 12-year-old competitor in 1950 finals, challenged this by racing at 190 pounds against much heavier competition. He copped his local championships and lost by a short nose in the All-American finals.

During the 1939 finals, one small entry asked for dry ice. General Motor's Charles F. Kettering followed the ice to the boy and watched him rub it on the rubber tires.

"Think that will help, son?" asked Boss Ket.

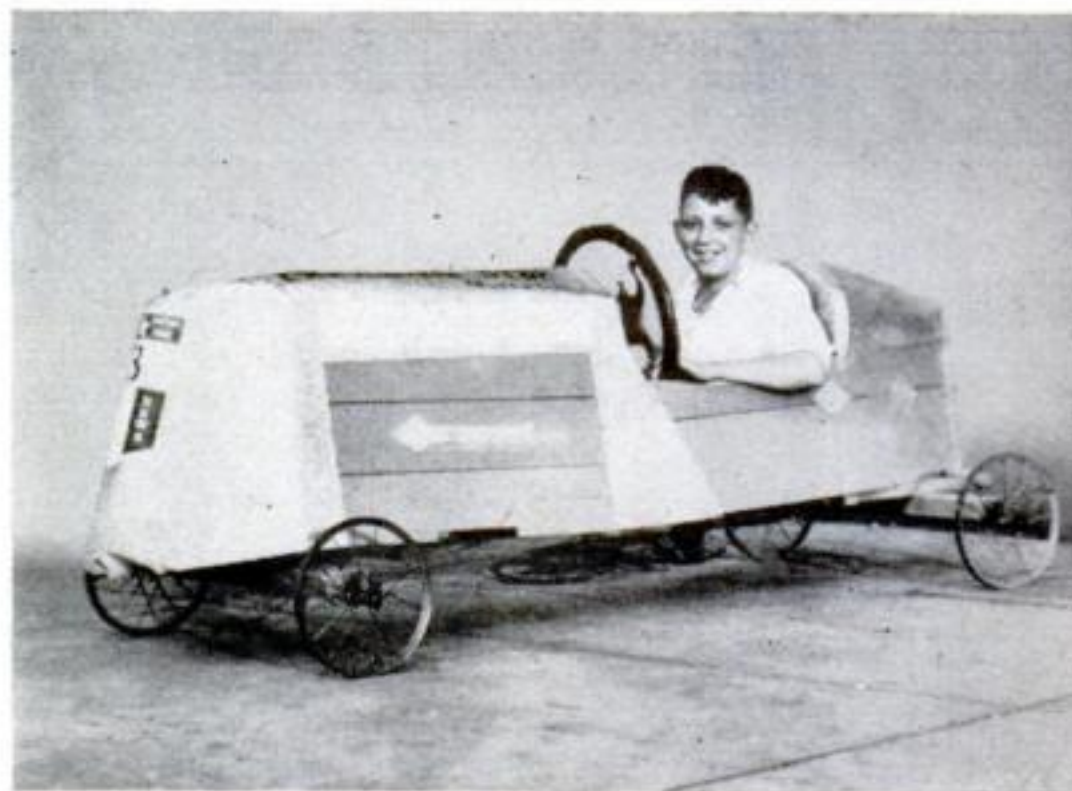
"Maybe," replied the lad. "One of the cars in my next heat has the same time as mine. I figure that if I can cool these tires they'll go faster and I might pick up enough to win." He led the heat, too—by the smallest fraction of a second.

There's plenty of variety in advice on how to win. Tommy Fisher, Detroit's only national champion (1940), credited his victory largely to use of a lapping compound for running in the wheel bearings. He rigged

all four to a motor and ran them simultaneously for the equivalent of 500 miles.

Darwin Cooper of Danville, Pa., who raced from Williamsport, Pa., and went on to take the Akron crown last year, feels that the wheels and "steering as straight as you possibly can steer" are a major part of the winning combination. Darwin worked for months running in his wheels. When the time came to go to Akron, he shipped the racer ahead but packed its wheels in his father's car. Then, to make sure they got to Akron on time, he had his cousin follow along in another car in case of a mishap.

Robert L. Ballard, who entered from White Plains, N.Y., to win the 1937 title at the age of 12, attributes his speed to good wheels, springs and streamlining—in that order. He believes that lubrication is rela-



WINNING CAR IN 1934, built by 11-year-old Robert Turner of Muncie, Ind., shows simple soapbox build of entries in first race.



PHOTOFINISH CAMERA, triggered by electric eye, catches winner of 1951 Derby crossing the finish line. Picture makes permanent record of spacing, times, order of finish.



DARWIN COOPER of Danville, Pa., receives the 1951 first-place trophy from T. H. Keating, general manager of Chevrolet, which sponsors Derby. Mother greets victor with hug.

tively unimportant; a single drop of very light oil on each wheel, he says, is best, although some winners have raced dry.

Even the car color enters the speed picture. In 1949, Fred Derks of Akron figured it all out with a complicated system of calculating heat, pressure and resistance, and raced a black car. He won handily.

Gilbert Klecan of San Diego had a somewhat similar theory in 1946, but the black was graphite, rubbed liberally over both car and driver. He emerged the national champ—but graphite is on the black list now. Too many black sheets, too many black pillow cases, too many black boys.

Klecan has some other ideas about winning cars. "The wheels must be balanced by drilling holes and covering them with tape," he says. "Bulges on the rubber must be

sanded off . . . bearings must be polished by running them slowly for many hours in light oil and powdered graphite . . . the steering must be sound, no slack, all inside . . . the lower the head and back in the car, the better . . . a slender, flexible boy is ideal . . . I built the car around my body . . . a knife-blade nose, tapering lines, every bolt and screw flush."

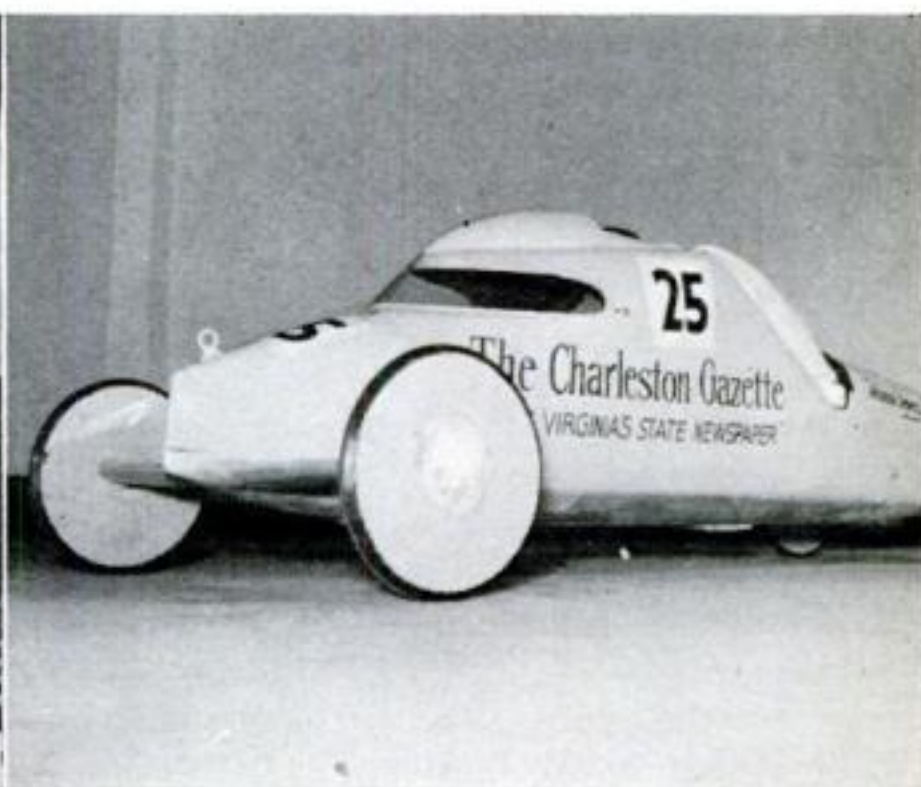
Growing Owners Must "Stretch" Cars

Growing boys being just that, his advice about a "slender, flexible boy" isn't always easy to follow. Tom Kurz, a competitor from Mt. Clemens, Mich., grew four inches taller between the '50 and '51 races. He ended up a tidy six foot one, and his car had to be made roomier for him.

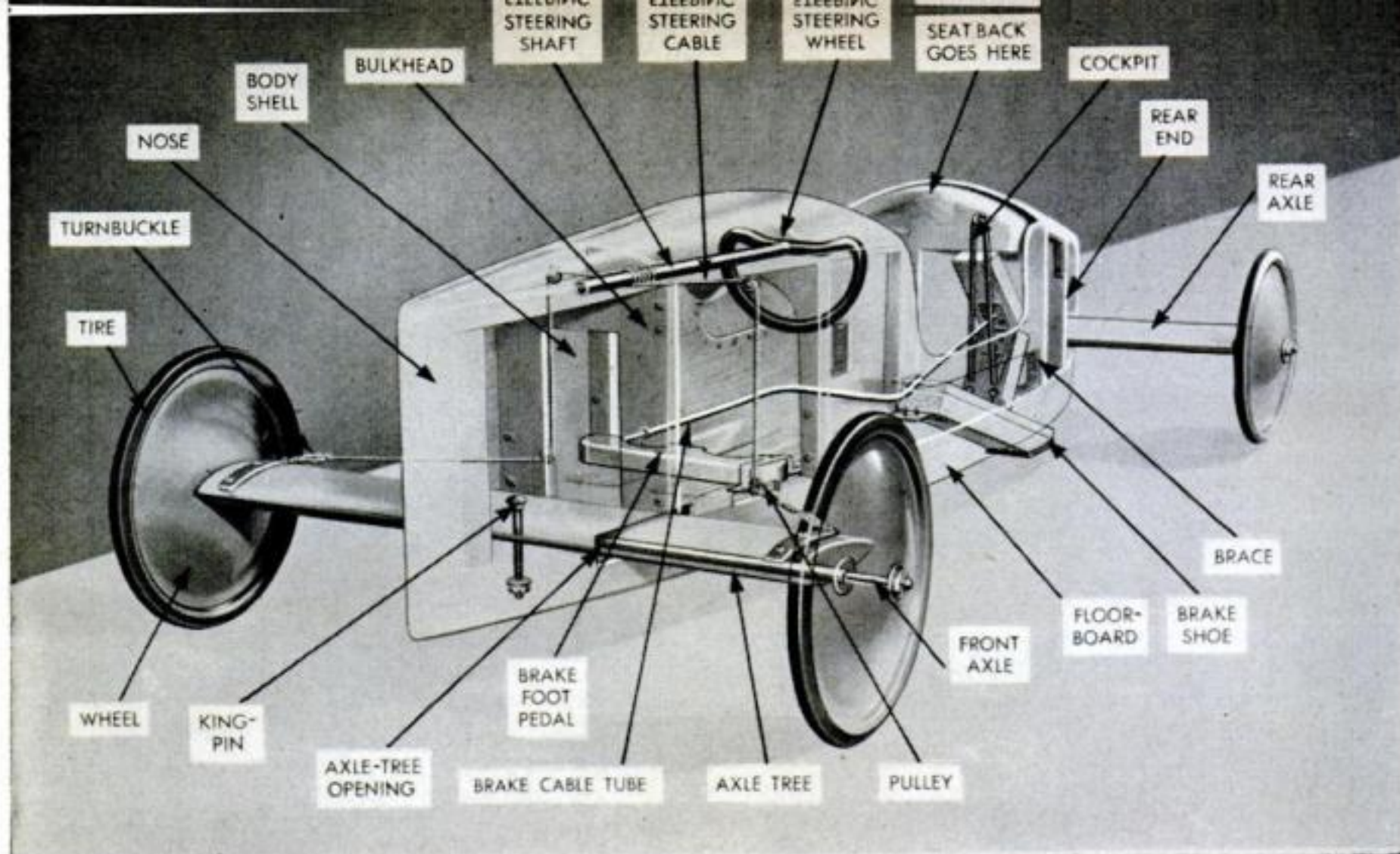
Once a driver not only tailored his car



BY 1938 streamlining began to appear, as shown on this entry weighing in at Akron. Today, tail fins would not be allowed.



SUPER-STREAMLINED JOB raced in 1940. No partial enclosures or windshields are allowed today, as shown by 1951 racers at top of page.



THIS IS RECOMMENDED CONSTRUCTION for current Derby entries. The rules aim at sim-

plicity in order to keep cars inexpensive, easy to build and—above all—safe to race.

to fit himself, but to fit the track it was to race on. Detroit has what is believed to be the only curved course, 620 feet of black-top roadway descending through River Rouge park. Because winds can be an important factor in speed, one lad in the Thirties built his car to swing above the wheels, so that his body presented a sail-like surface to the quartering breeze. Today, this would be outlawed as unsafe.

Well Equipped Speedway

The Derby tracks, scattered across the country, are alike only in having a hill to roll down. Hilly Boston had no natural hill available and had to build one from scratch. Owensboro, Ky., made the track a community project, with land, materials and labor donated. But the heart of the soap-box program is Akron's Derby Downs, the championship track.

The Downs is a 30-foot concrete speedway, 975.4 feet from start to finish line and 1,265 over all. From the starting line it drops sharply with a 16-percent grade, then eases off to six percent. Dotted lines divide the track into three lanes.

Behind the rubber-surfaced guard rails that edge the track are stands for spectators. At the top of the hill, behind the starting line, are the garage and service pits. These are manned by mechanics who help the boys tune up their entries. A hospital is nearby.

The Downs will really come to life next

August, when some 150 local champions gather for the fifteenth annual All-American Soap Box Derby. The boys are assorted sizes between 11 and 15 years old. Their cars are assorted sizes within the limits of the rule book—no more than 28 inches high or 42 inches wide; wheelbase at least 40 inches; over-all length not over 80. The eight-inch steering wheel must clear the driver's body by at least two inches, be no farther forward than his knees, and be set so he can look over the top of the car. No transparent materials can be used anywhere in the car—which eliminates windshields. The driver must sit in an open cockpit in a "position permitting easy operation of steering and brakes and a clear view to the front and both sides."

All cars must have four wheels, running on two axles. Weight can be added to the car to bring it up to the 250-pound limit, but—again for safety—must be firmly attached to the car.

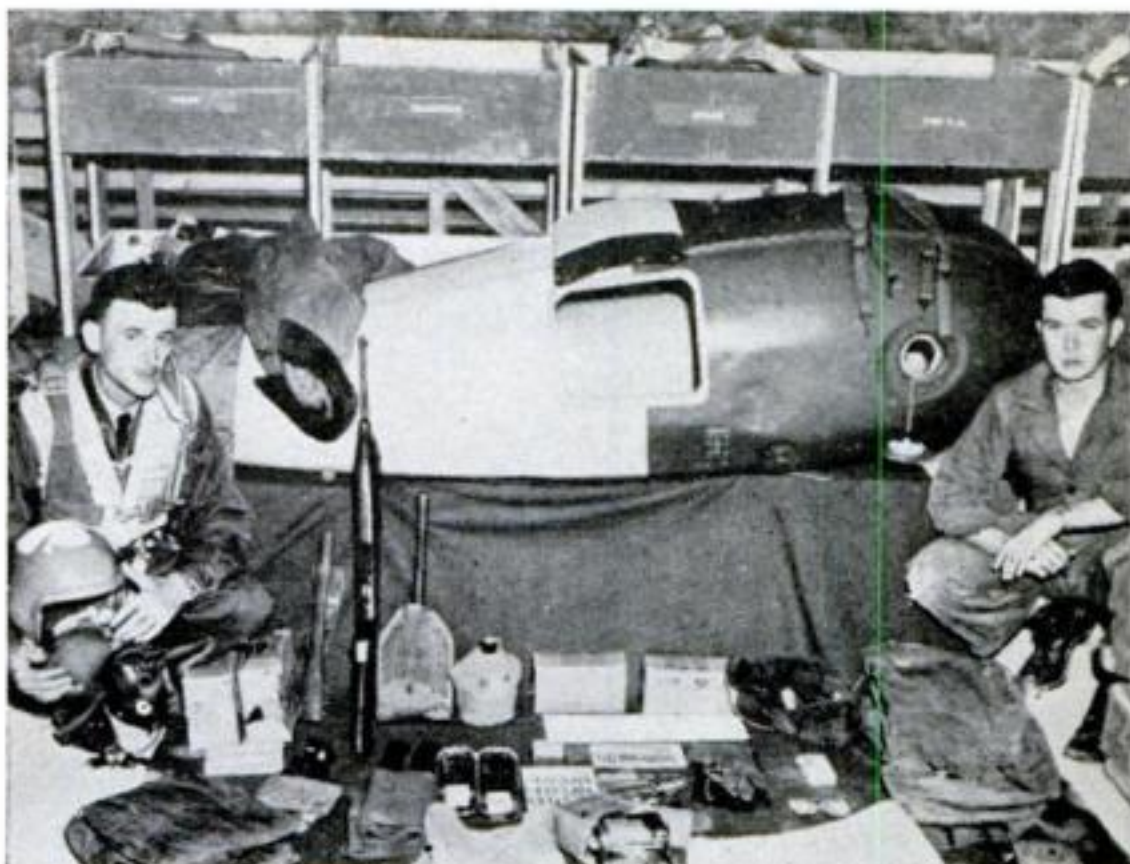
Entries Get Thorough Examination

The racers must be built so that they can be easily examined, for inspectors give them a careful going over before local and national events. Dangerous cars are weeded out. Bearings are examined to make sure that precision units have not been used. Any work that looks as if the boy might not have done it himself gets hard scrutiny. Should

[Continued on page 246]

Deadly Napalm Tank Becomes Mercy Bomb

MAJ. ROBERT L. HOLSOMBACK and Sgt. Walter C. Monize noticed an obsolete napalm tank at their air base in Korea and figured it would be a natural for dropping survival equipment. Now the tanks are saving the lives of downed airmen. Painted for better visibility, they are dropped at low altitude packed with heavy clothing, food for three days, water-purifying tablets, a carbine, ammunition, a first-aid kit, a portable stove and a radio.

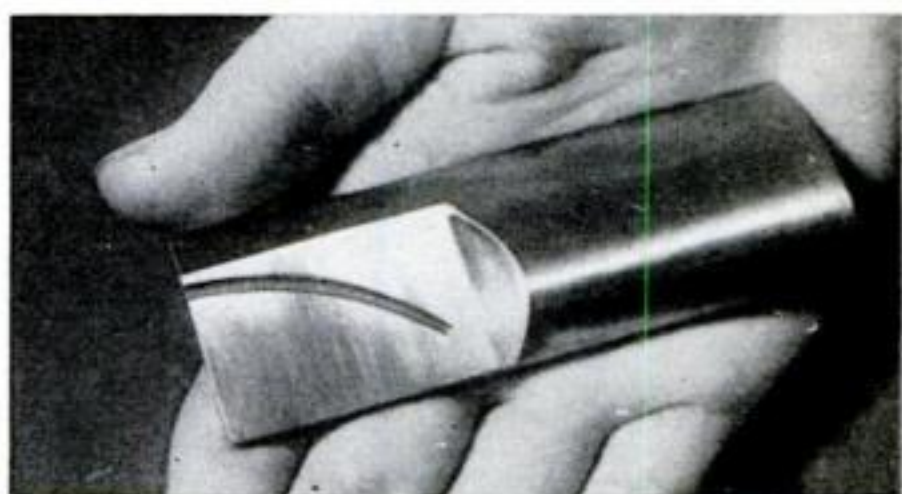


Robot Records Road Bumps

NEWEST tool for designing more comfort and safety into passenger cars is the ride recorder above. The device "feels" with the aid of a small gyroscope, a gas-driven turbine and a spark coil. A metal pointer makes a wavy-line record on tape of the slightest rolling, pitching or zigzag motion of a car under test. Chrysler engineers developed it to compare the smooth-riding qualities of various car suspension systems.

Shot in Roots Kills Weeds

You can rid your lawn of dandelions without even bending over—just poke the tip of this plastic tube into the ground near the roots of the weed. A spring-operated rubber valve then releases four streams of weed killer. It can be filled with any standard formula, and holds enough for 125 shots. The 30-inch tool, called Dispensaweed, is distributed by the Ceca Corp. of Glendale, Calif.



Electricity Drills Crooked Holes

IT SOUNDS like a left-handed screwdriver, but a drill for crooked holes is no joke. There now is such a thing. It drilled the curved hole shown in the sliced-open sample above, and may lead to simpler lubricating systems for engines.

George Kemeny of Westinghouse invented it because he wanted to measure temperatures inside steel castings and couldn't reach the right spots with a single straight hole. So he attached a curved, hollow electrode to an electric disintegrating machine. The arc eats a path of the same shape as the electrode. Water flowing inside the electrode washes out molten metal.





BRITANNIA 1840
14 DAYS

**SS United States is out to win
Atlantic speed supremacy from
Britain's Mary and Elizabeth**



MAURETANIA 1910
4 DAYS 10 HOURS



NORMANDIE 1937
3 DAYS 23 HOURS



QUEEN MARY 1938
3 DAYS 20 HOURS



UNITED
STATES 1952 ?????

By C. B. Palmer

THIS month the waters of the Atlantic Ocean will feel for the first time the smooth rush of something very special in the way of superliners. The S.S. *United States* will be taking her builder's trials and acceptance trials preparatory to entering the de luxe transatlantic trade on July 3.

For the first time in 75 years this country has built a competitor in the top-speed bracket. The entirely mythical "blue riband," denoting the holder of the record for the fastest passenger-ship crossings of the Atlantic, has been in European hands for a century. In a sense this has been a matter of default; American ship operators in recent years have not chosen to enter the competition for many reasons. We have built many



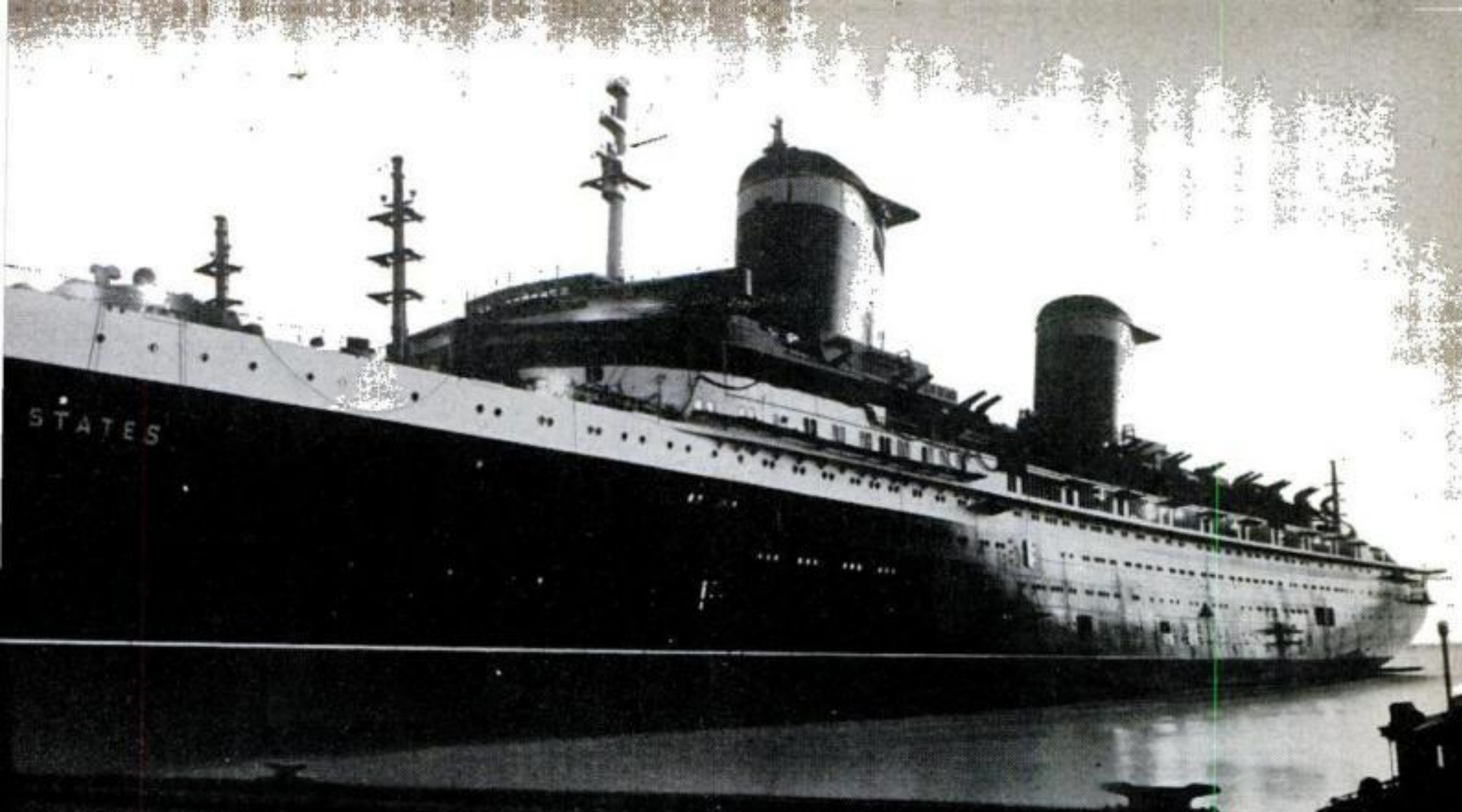
America's

Racing lines of 990-foot *United States* stand

fine and popular ships—highly comfortable and of good speed—but not ships designed to travel at the 30-knots-and-above necessary to make record passages and headlines. The *United States* is definitely in this field.

Beyond that there are other toppers about this ship. She is the largest passenger vessel this country has ever built—51,500 gross tons. Operated by a 1,000-man crew, she will carry more passengers than any other American-built ship—nearly 2,000. She is fireproof beyond any standard ever set by any commercial vessel under any flag. She is air-conditioned throughout—all public rooms, cabins, crew quarters. She uses more aluminum than any other single structure ever built, land or sea. It is used structurally and for decoration and furnishings.

Usually, such technical matters do not strike the eye of the beholder or customer. But those who board the *United States* for her maiden voyage and for trips thereafter



New Liner Challenges Queens

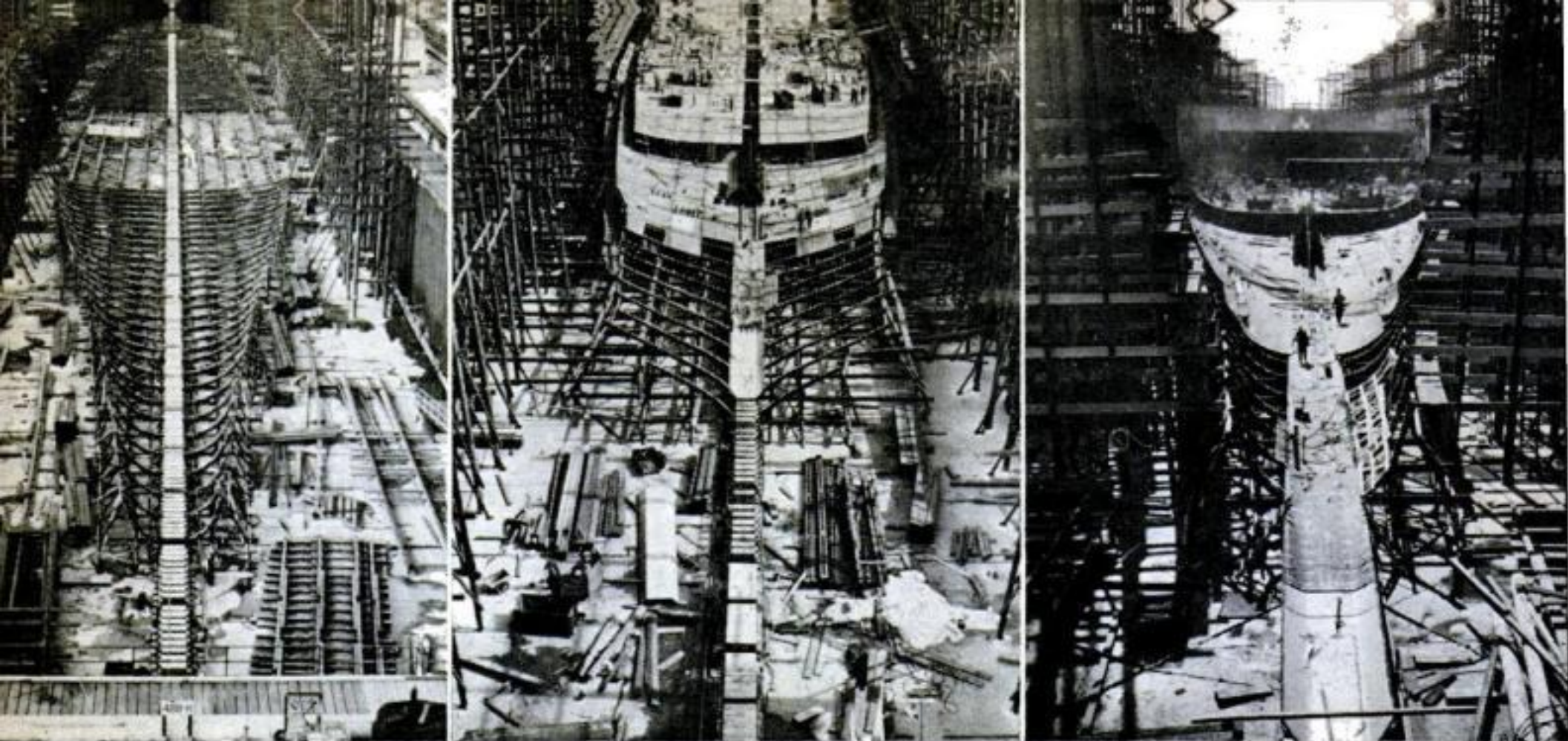
out as she lies at Newport News dock. Note radar tower, which replaces the usual foremast.

will sense the new qualities. At dockside she shows all the bigness of her 990-foot length, her 101½-foot beam and her 13-story height above the waterline. Yet there is a lightness and easiness about her lines. The bow springs forward not sharply but cleanly and in harmony with the bulk behind it. The white superstructure and the great stacks lie easily on the sleek black hull.

Step aboard this ship and both your eyes and your feet tell you there's something different about her. On the open decks you expect the "plock" of teak decks underfoot and the feel of teak rails under your hands. But there's no teak. The decks are a brand-new mastic composition spread over aluminum or steel. The rails are long sections of extruded aluminum, glossy under a special finish. And the decks are remarkably open, swept free of all possible protrusions and fittings, with few ups and downs. The overhead is sheeted smoothly in metal to conceal

FOUR OF THE THOUSANDS of men who built the *United States*. At times as many as 3,000 men—skilled in more than 150 individual trades—were working on the ship at once.





How a Ship Grows

SUCCESSIVE STAGES in the growth of the *United States* are shown in the graving dock where

she was built. She was too big for the usual ways. Instead of being launched, ship was "floated" by flooding dock. First piece in place was 55-ton keel section. As ship grew,

beams and pipes that would be eyesores.

The same inside. The corridors are long straightaways, with few jogs and turnings and with the usual plumber's nightmare all out of sight. Many of the public rooms extend the full width of the ship. There are many pieces of art on American themes, some in metal or glass—no wood is used in the ship itself. There are screens of glass sculpted by sandblasting. There is a plaster relief map of the North Atlantic. There are aluminum panels anodized to give them soft colors. There are four-foot sculptures carved out of foam glass.

Furnishings Retard Fire

Fabrics and wall finishes run the whole spectrum, but both fabrics and paints are fire-retardant. Furniture is aluminum; upholstery and cushions are springy and soft but they are filled with a new material that will not flame.

For those who must take their shoreside fun to sea with them there are all the facilities. There are two smart theaters for movies and other entertainment. There are swimming pools, lounges, restaurants, night clubs, libraries, barber shops, beauty parlors, gift shops—all the things that go into a modern luxury liner. There is even a special refrigerated room for the storage of those bon-voyage baskets!

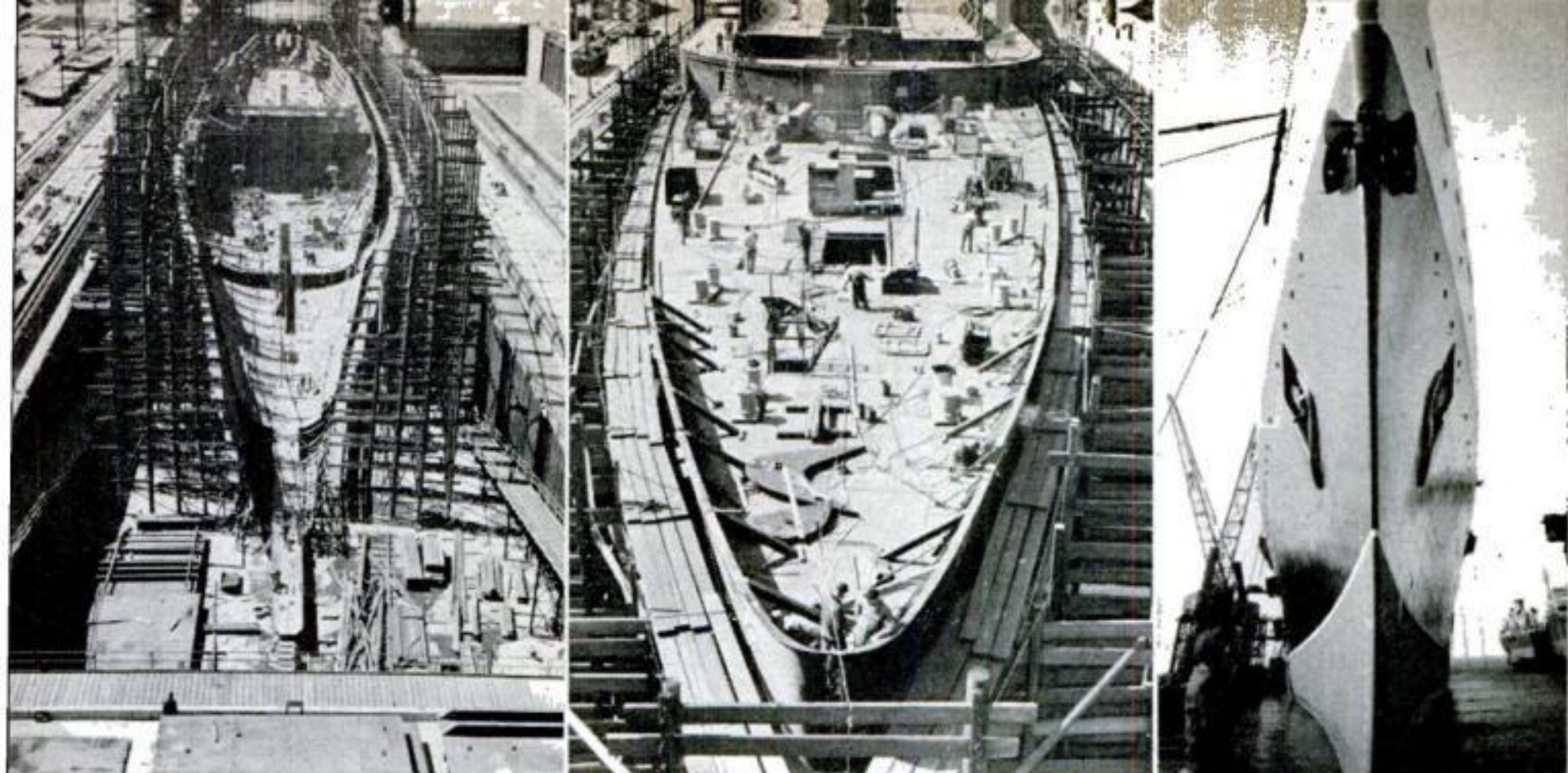
For the athletic-minded, there are sports decks—topside, forward and aft—plus a gym

and indoor pool. Enclosed promenade decks sweep along the sides. Cabins range from four-in-a-room for tourists to suites up to five rooms in first class. Cabin class—524 passengers—and first class—888 passengers—have private baths; in tourist class—554 passengers—the baths are shared. The cabins have a wide range of color schemes—soft tones and bright, worked out in contrasts, a far cry indeed from the dead whites and "institutional" colors familiar not so long ago.

Can Be Converted into Troop Transport

Despite the ship's charms for pleasure travelers, she was built with very different auxiliary purposes in mind. In time of war the *United States* would become a troop transport, capable of carrying a full Army division. Accordingly, Uncle Sam, who has provided part of the financing, is keeping some of the secrets about her. Her compartmentation—the number and location of watertight bulkheads with their automatic doors—is not being told.

Details of the power plant also are shielded by security. Certain things, however, are evident about the punch in the *United States*. Here is a ship of 51,500 gross tons, as against the 80,000 or so of the *Queen Elizabeth* and the *Queen Mary*. Yet this ship will carry almost as many passengers as the Queens and will carry them as fast. This means that important space has been gained somewhere, and it's



huge subassemblies were built ashore and lifted into place. More than 1,500,000 steel and aluminum rivets and 1,500 miles of welding were required. Steel plating would make a

6½-foot walk 4¾ miles long. More than 8,400 master drawings and nearly 1,500,000 blueprints had to be made. Final picture shows *United States* in the outfitting dock.

a good guess that it has been gained in boiler room, engine room and fuel storage.

The boilers and turbines operate at very high temperatures and high pressures. To handle these in the small space and weight called for new tricks by the metallurgists who worked out the alloys and by the fabricators who designed and built the machinery. In the laboratories and shops of the Newport News Shipbuilding and Dry Dock Co., which built the vessel, and of Westinghouse and Babcock & Wilcox, which built the engines and machinery, technicians took all that was known about marine propulsion and added a few new items.

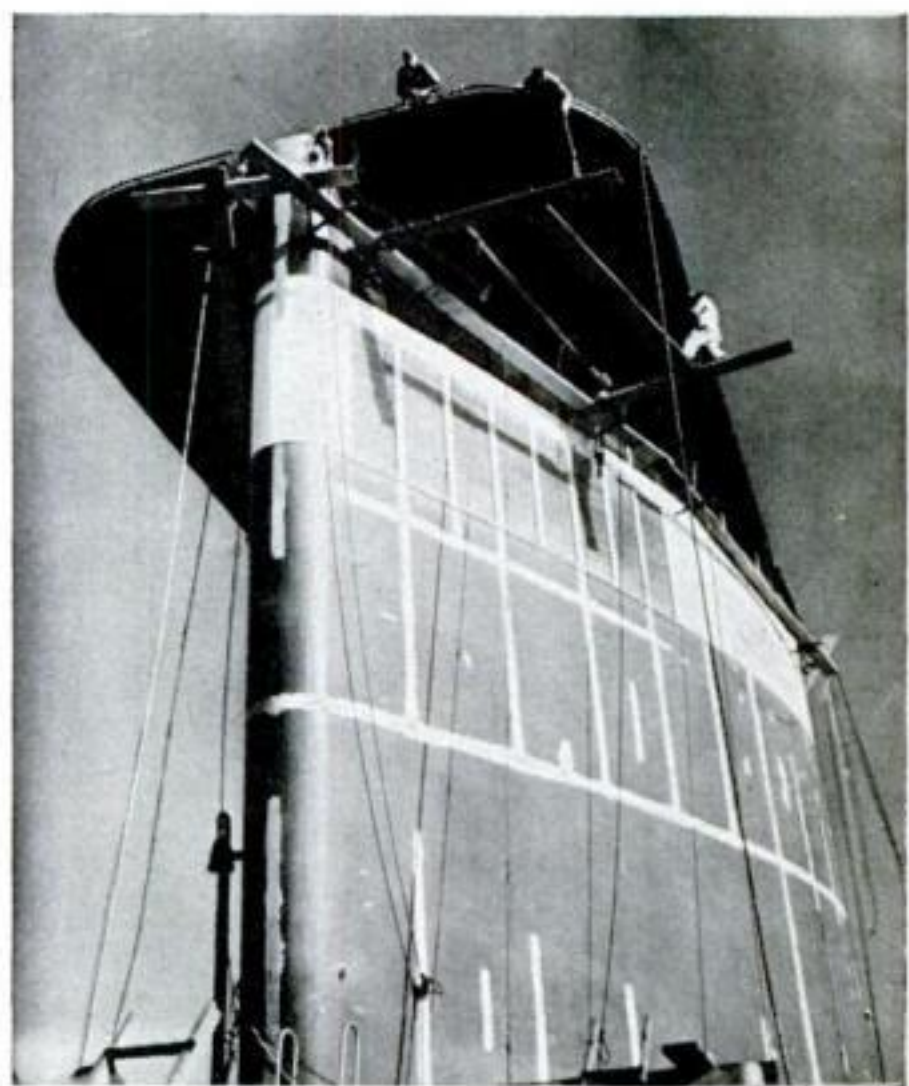
Air Conditioning a Problem

The air conditioning was a highly desirable feature but its headaches were many. Finding space for the pumps, fans, ducts and controls was one of them. There are really 50 independent air-conditioning systems, and their ducts range in size from three inches to some that are big enough to drive a truck through. And once fitted in—on paper—there still remained the problems of building them and making them work.

The space problem was one for the designers. As fast as they cleared a blueprint it went to the sheet-metal shops at Newport News and the men began cutting out and assembling the fantastic shapes that had to carry the air around corners and up and

down in the ship. Subassemblies were made as large as possible and stacked up on the dock. There they looked like the principal ingredient of alphabet soup—and in a foreign language at that. But they were fitted in place and hooked up.

Making the air-conditioning systems work



HUGE "SAMPAN" STACK, one of two, gets final touches. Wind tunnel tests of many stack models showed this design would keep fumes clear of decks under all speeds.

was a special problem. Air conditioning at sea offers different problems than on land. There is more moisture in the air most of the time; there are greater contrasts of temperature inside and out. The problem of condensation was severe. It was solved by insulation and by using filter traps at intervals all along the ducts. These collect the moisture in a few spots rather than let it accumulate anywhere on the surface of the ducts. Another feature of the system is the thermostatic control in each cabin. All the air, filtered from the outside, is circulated in the ship at 50°. When it reaches a cabin it passes through an electric heating unit controlled by the thermostat; the passenger in an outside cabin may want more heat, one in an inside may want more cooling. Each will get what he wants.

Aluminum Was Tricky

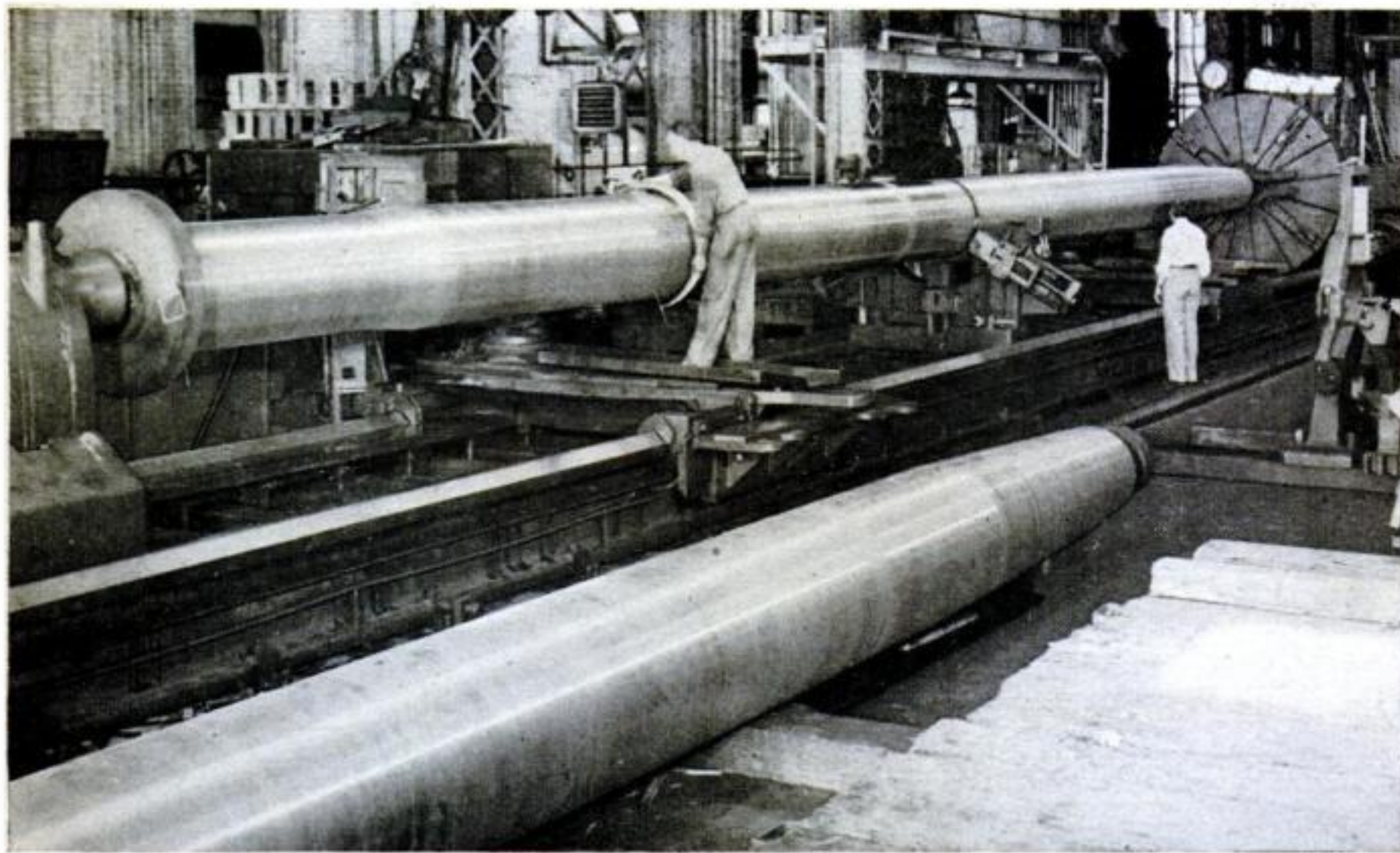
The use of so much aluminum, in so many ways, called for new tricks. Plain sheet was no problem, and some shapes could be stamped, molded or extruded. But when it came to the stacks it was economic folly to think of shaping them with dies and presses. The heavy sheets could not be worked like steel, with rollers or torches and hand hammers, because aluminum just won't shape that way. It had to be worked slowly and carefully by hands and clamps and

special jigs. And when the stacks were done they were so big they had to be cut in half to be lifted into place.

The aluminum rails were turned out to approximate dimensions, including all the curves and fittings, in the shops of the Aluminum Co. of America. Then they were put in place, with precise machining, on the ship. Next they were marked, removed and shipped back to Alcoa for "alumilite" coating, the final finishing process. And then they were sent back to the ship for permanent installation.

Aluminum panels and decorations had to go through much the same laborious process. Aluminum rivets were handled like trick confectionery. Received from the factory, they were first heated to 1,040°, to "smooth out" the alloys, then quenched in water and rinsed in alcohol. To prevent the rapid aging which takes place at ordinary temperatures, the rivets were sunk in freezer cabinets at 40° below zero. Thereafter they were stored in insulated containers (including standard ice-cream cabinets) until they were driven. Once in place the aging, which results in greater strength, could take place.

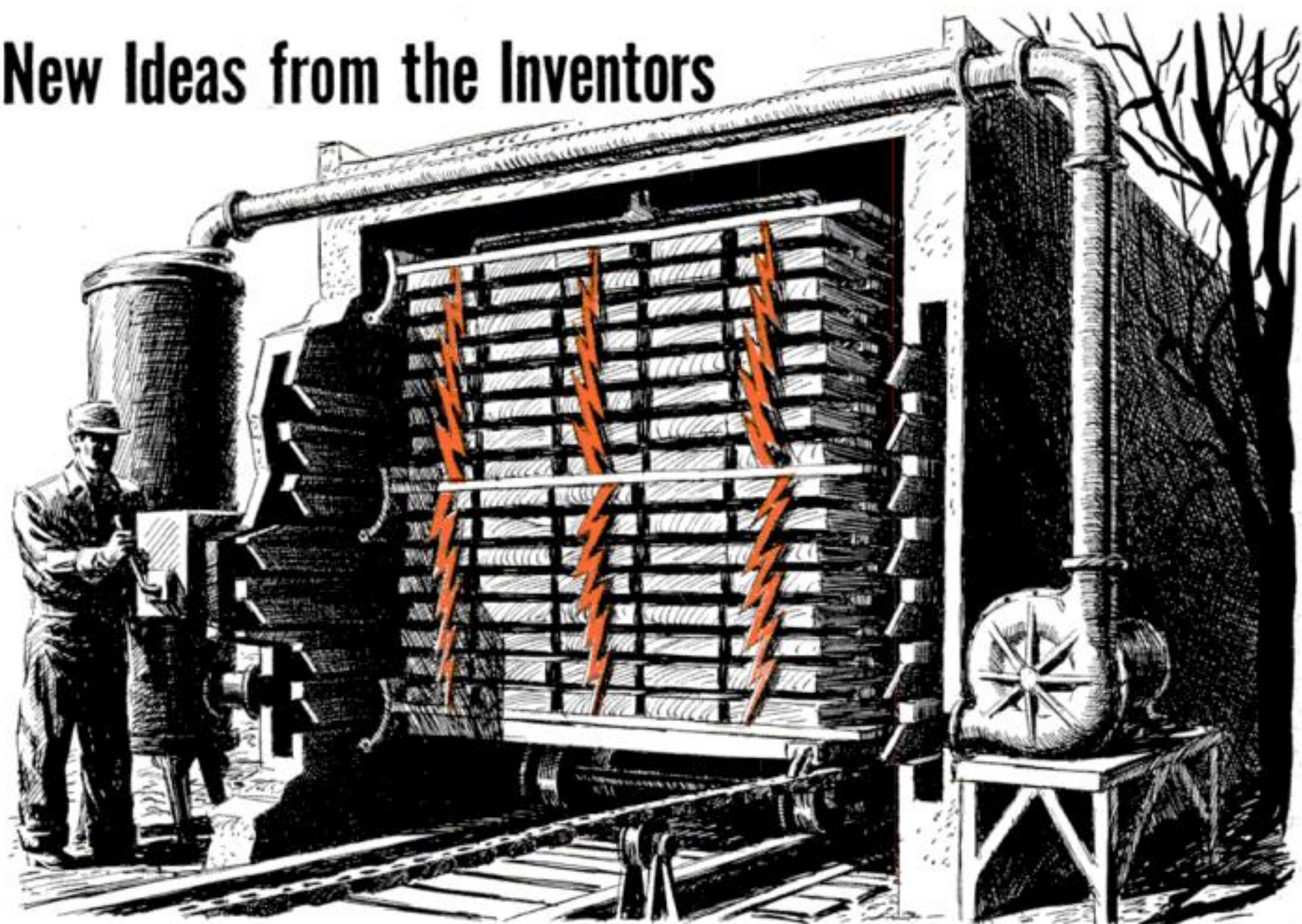
The virtue of all this aluminum topside is of course its lightness. Averaging one-third the weight of steel, it lowers the ship's center of gravity, in turn reducing her tendency to roll. [\[Continued on page 270\]](#)



GIANT PROPELLER SHAFTS of the *United States* are made of special alloy steel. Steam tur-

bines of secret design turn four screws fast enough—designers hope—to break record.

New Ideas from the Inventors



1 Heat Plus Radio to Dry Lumber. Although it has been known that high-frequency radio waves will dry green lumber much quicker than conventional hot-air methods, their use has proved too expensive.

A proposed process would combine both methods to cut costs. Lumber would progress through three compartments, being dried by hot air in the first two, and by hot air plus radio waves in the third.



2 Seesaw to Trap Mice. No mouse could steal the bait from this rocking trap. If one so much as stepped on it, the baited end would tilt down and trip a trigger underneath, releasing the spring jaw to snap shut on his neck. The trap could even be used without bait if placed in a path mice had to use to reach food.

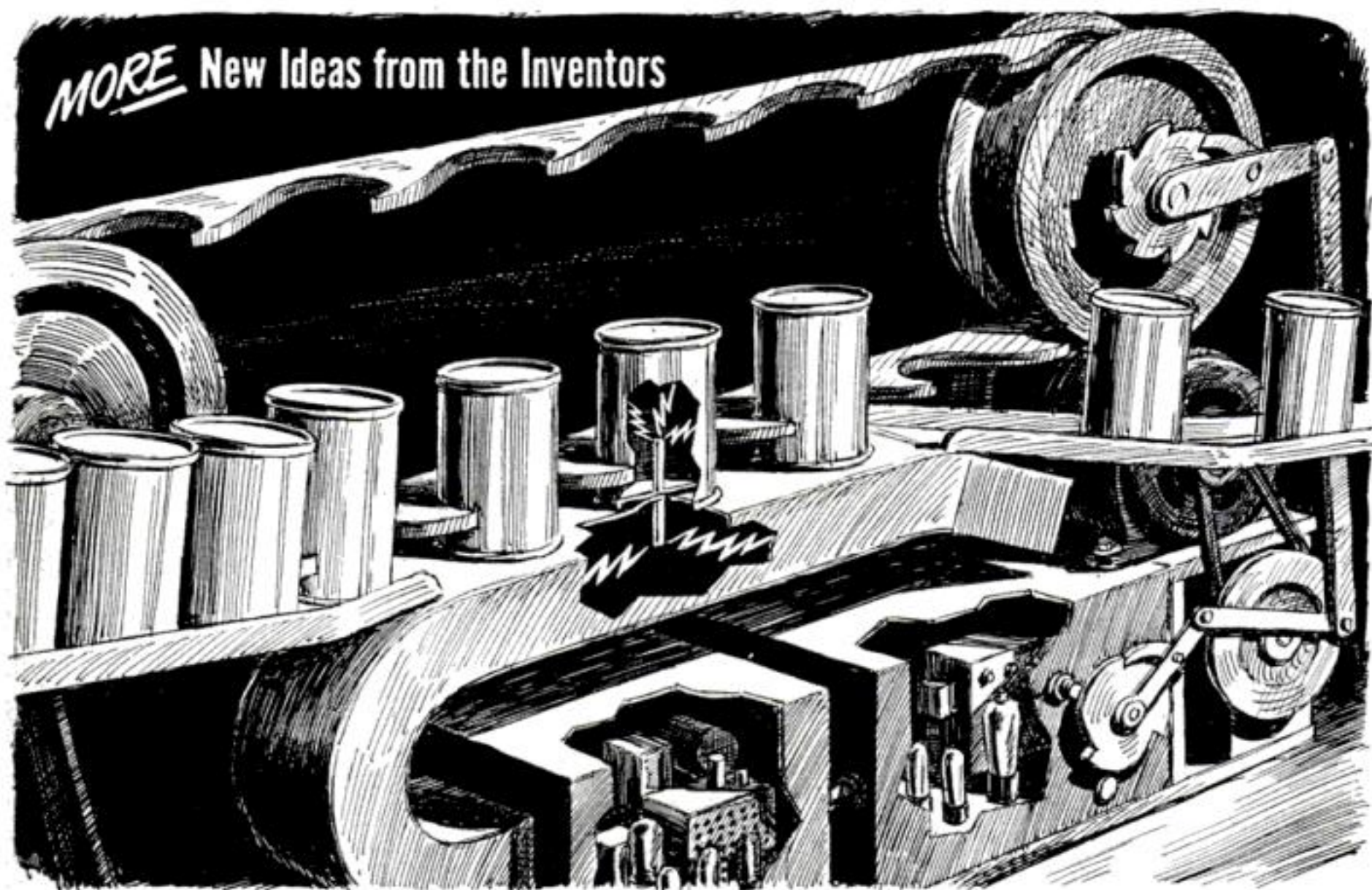


3 Shoe Lights to Blink In Dark. Clipped onto a child's shoes, these novelty lights would blink on and off as the youngster walked. Each light would have a bulb, a flashlight cell, and a switch consisting of a metal ball that would open and close the circuit as it rolled back and forth with the motion of the foot.

Please turn the page for more new ideas.

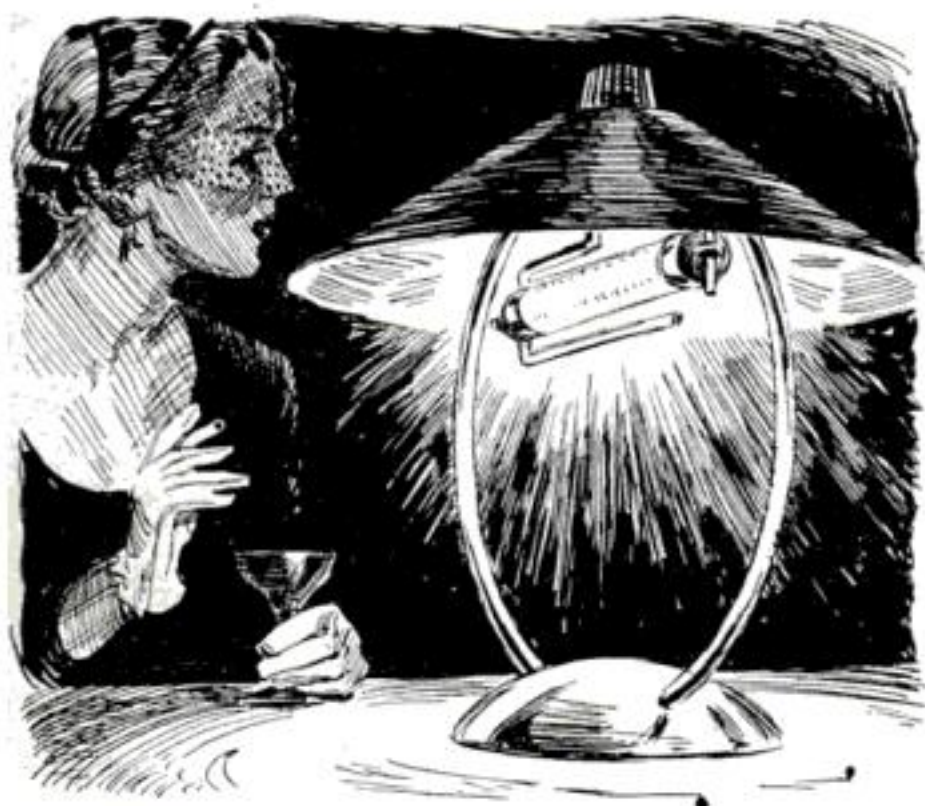
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MORE New Ideas from the Inventors

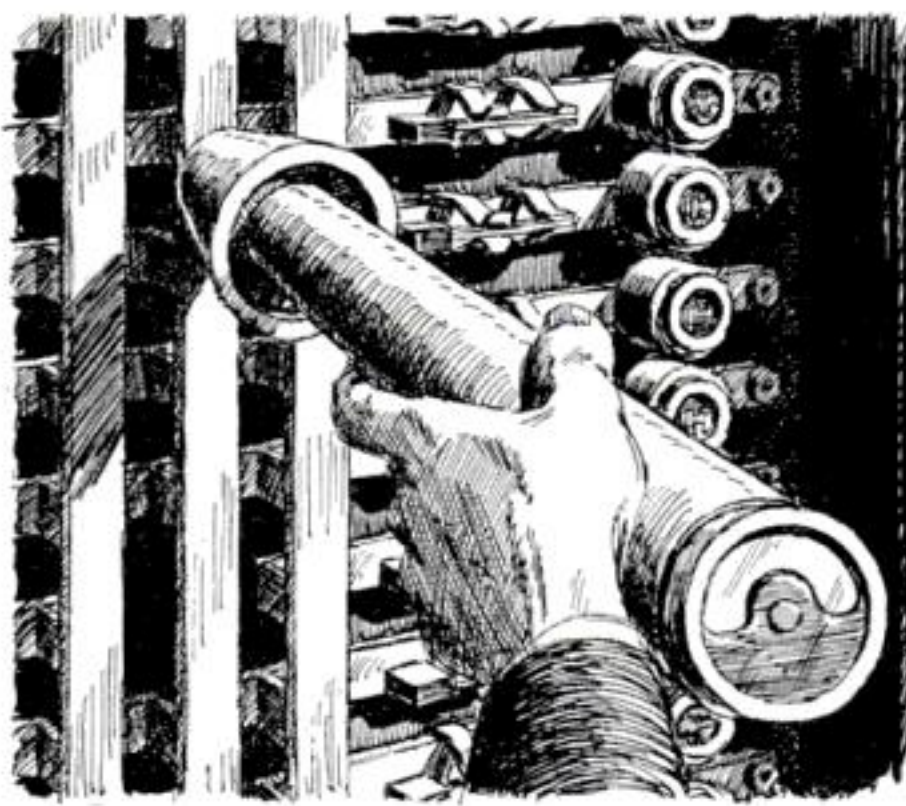


4 Radar to Preserve Food. Tests of radio waves for sterilizing food could not use sealed cans because the metal acted as a shield. This invention may be the answer. It proposes a can fitted with a rod inside its

bottom to act as half of a dipole antenna. The second half would be in the wave guide of a high-frequency generator. Bringing the two together would transmit the waves to the canned food.



5 Lamps to Have No Cords. Wiring a large restaurant for table lamps should be no problem according to the designer of this system. It uses no wires. The fluorescent lamps would be powered by radio energy radiated from a ceiling antenna. The circular support on each lamp would serve as a loop antenna to pick up the power.



6 Tester to Spot Live Circuits. Held against a bus bar, this tester would spot a live line. The indicator would be a glass-windowed cell containing two electrodes and two non-mixing liquids of different conductivities. If current flows, change in distribution of the fluids would show in the window.

Patents on these inventions have been granted to: 1. H. Wood, North Berwick, Me.; 2. E. Brust, Norwood, N. J.; 3. N. Rikelman, The Bronx, N. Y.; 4. K. Smith and A. Grinnell, Los Angeles; 5. N. Wales, New York City; 6. H. Petch, Edgware, England.



Tractor Steers Like Hook & Ladder

THIS new lightweight German tractor has two steering wheels, one for each axle, so that it can turn in its own length. Instead of pulling farm implements behind, it carries them in front on a frame, enabling the driver to see how the work progresses. For spraying insecticides, the tractor carries a 200-gallon tank (inset above). It can cover a 25-foot-

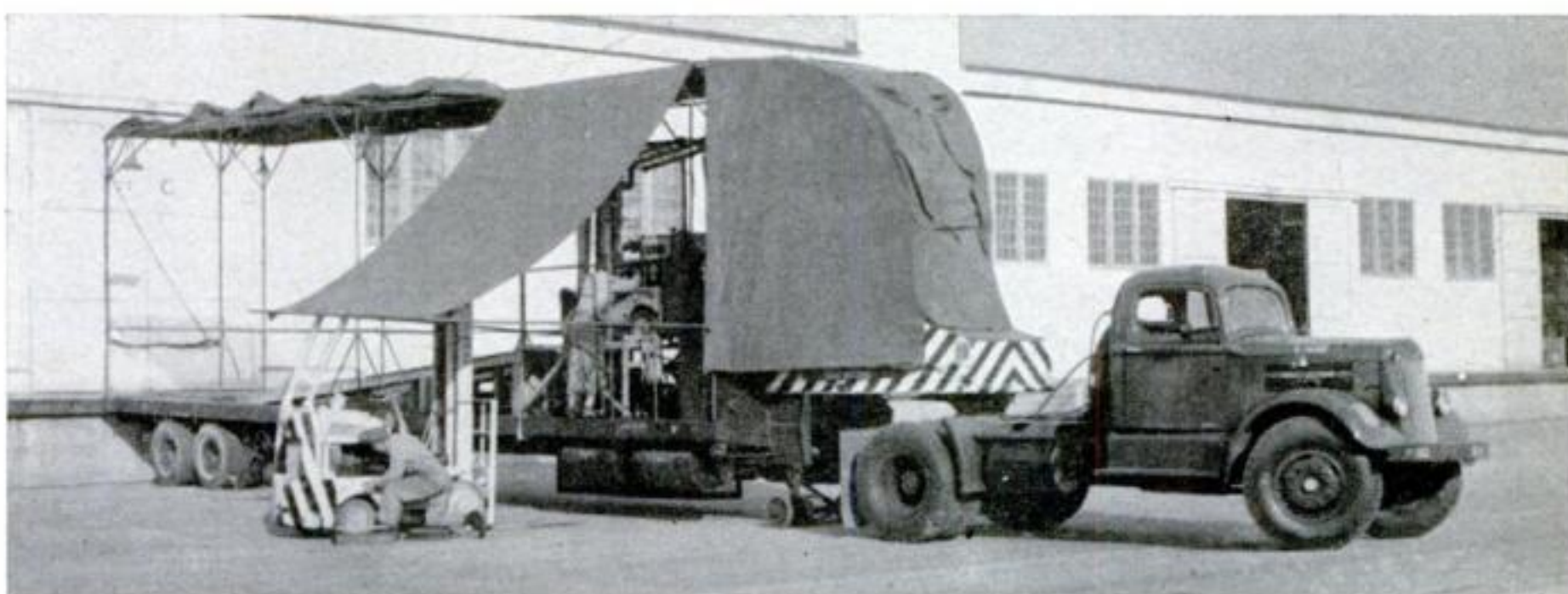


wide strip while moving five miles an hour. Made by H. Lanz Co., of Mannheim, it is powered by a Gemo engine.



You Can Wash This Air Filter

A NEW filter for hot-air furnaces and air-conditioning systems need not be replaced when dirty—you just wash it and reuse it. The filtering material, a plastic film shredded into a porous mass, picks up an electrostatic charge when exposed in a current of air. This charge attracts and retains pollen, dust, soot and even fine cigarette-smoke particles suspended in the air. Simply rinsing in cold water cleans the filter, and it can be put back in place while still damp. Goodyear Tire & Rubber Co., Akron, makes it.



Service Station Goes to Trucks

THE service-station-on-wheels above goes to the aid of fork-lift trucks and tractors whenever they need repairs at Cheli Air Force Depot, Maywood, Calif. Towed by a heavy truck, the 40-foot flat-bed trailer is

equipped to change a wheel or elevate the little vehicles on a grease rack. Electric lines and hoses permit work to be done on three trucks at once. A gas-powered compressor supplies air pressure for greasing apparatus.



ENDOMORPH

How Your Shape Shapes Your Life



MESOMORPH



ECTOMORPH

The muscle men wield power, size 46s enjoy themselves, but it's the skinny, nervous guys who have the drive to get the girls.

By Liam O'Connor

A JUNIOR executive I know has a pet method for hiring men. "I tell the job applicant to look me straight in the eye," he says. "If the fellow blinks before I've finished counting ten, I don't take him on. I know right away he's sneaky. He'll probably lie. He may steal."

This procedure is simple and quick. But scientific research has revealed that confirmed criminals often can hold an unblinking stare longer than many an honest citizen.

From earliest times, men have tried to get clues to human personality by casting horoscopes, or by reading the palm, or by studying some other part of the anatomy—

THE THREE EXTREME BODY TYPES are shown above—the fat, lazy endomorph; the strong, energetic mesomorph; the skinny, nervous ectomorph. Most people are not extreme types—but every type, extreme or not, can be accurately measured.

The Nervous Ectomorph Worries All Day Long

Mr. Ecto awakes harried and unrefreshed. On the way to the office, he gulps down a quick cup of coffee, then dashes for his bus. He has difficulty cultivating good living hab-





Careful measurements of 100,000 people show close relationship of body build to personality.

the skull, the forehead, the eyes, the fingernails, the feet. When subjected to analysis, however, all these magical systems have failed to live up to their claims.

100,000 Bodies Can't Be Wrong

Yet common sense stubbornly insists that people *can* be sized up—to some extent—from physical appearance and behavior. Aren't most fat men placid and easy to get on with? Aren't thin men liable to be jittery and rather difficult customers? Can't scientists, then, systematize such items of information, discover more of the same, and give us a comprehensive and practical classification of human beings?

Answer: It now looks as if they *can*.

The man who has come closest to doing

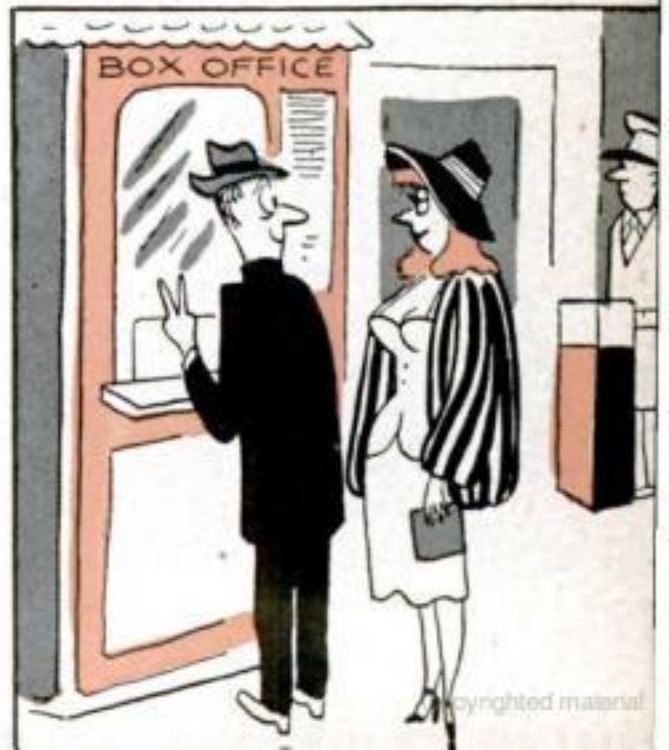
it is Dr. William H. Sheldon, director of the Constitution Laboratory at Columbia University. Dr. Sheldon has been investigating body build and temperament for about 25 years. Thus far, he and his associates have produced three monumental volumes: *The Varieties of Human Physique*, *The Varieties of Temperament* and *Varieties of Delinquent Youth* (published by Harper & Brothers).

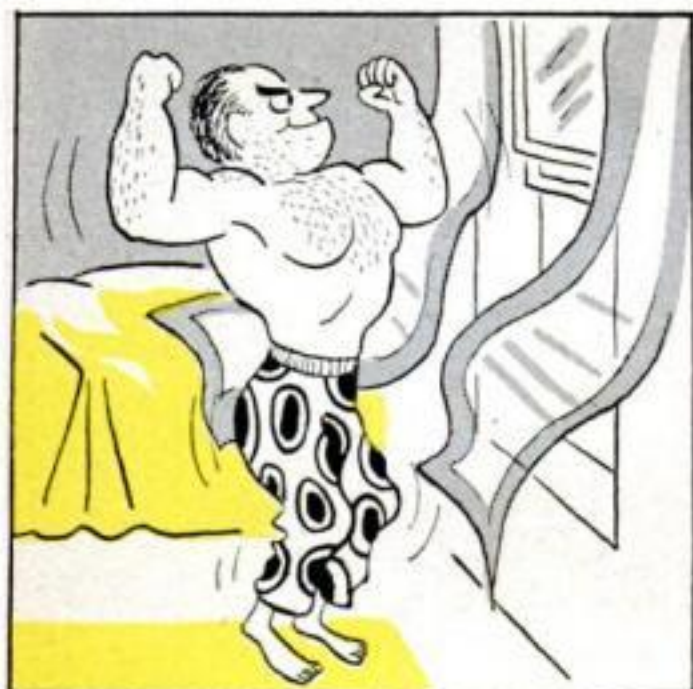
Four more books are now in preparation. About 30 medical schools, hospitals and other institutions are cooperating with Dr. Sheldon. The Rockefeller Foundation recently made a grant of \$100,000 for further research. He and his co-workers already have photographed and studied more than 100,000 individuals.

Dr. Sheldon classifies people into three

its, is frequently late, often untidy. At work, he prefers to be off by himself. After hours, he struggles to relax, seldom can. But his

evening is likely to be the pleasantest time of day—for the nervous little guy is the lady-killer. Honest!





The Rugged Mesomorph Puts in a Bustling Day

Mr. Meso arises briskly, plunges into vigorous setting-up exercises, then wolfs down a moderate breakfast while he concentrates on the sports page. Later, he swings aboard

basic constitutional types according to the three different layers of cells that make up the human embryo. The inner layer, the endoderm, has most to do with the development of the digestive machinery. The middle layer, the mesoderm, has most to do with the formation of muscles, the skeleton and the circulatory system. The outer layer, the ectoderm, has most to do with the development of skin, nails, hair and nerves.

Three Basic Body Types

Now these three layers don't have exactly the same amount of influence in every person's history. Some individuals have particularly large stomachs, livers and intestines. They put on fat easily. These are called *endomorphs* or fatties.

Those who have big muscles, heavy bones, powerful hearts and large blood vessels are called *mesomorphs* or muscle men.

Those who are thin, with relatively great surface area compared with bodily mass and with highly developed nervous systems, are called *ectomorphs* or nervous types. These people, incidentally, are not necessarily more intelligent than other types.

To classify a person, Dr. Sheldon rates the nude body for fat, muscles and nerves—always in that order—on a seven-point scale. On this scale, 1 represents the minimum, 7 the maximum and 4 the average.

The extreme endomorph or fatty therefore has 7-1-1 as his *somatotype* (body-build) number. If he were less fat, more muscular and more nervous, his somatotype might be 6-2-2 or 5-3-3. In the same way the extreme mesomorph or muscle man is rated 1-7-1, and the extreme ectomorph or nervous type is rated 1-1-7. A man who is average in all three components—fat, muscle and nerves—is 4-4-4.

The Happy Endomorph Enjoys the Whole Day

Mr. Endo sleeps soundly, arises to a huge, unhurried breakfast attended by a large and devoted family. Later, he ambles off to the office, where he is a constant source





a speeding commuter train with daredevil abandon. A forceful, aggressive businessman, he drives home a point at the office while his



subordinates cower, then knocks off for a work-out at the gym. His idea of an evening's relaxation is a fast ride in a powerful car.



Dr. Sheldon's next step is to measure how each type of body chassis behaves. For this he has developed a scale of temperament: a list of 60 personality traits, boiled down during five years of testing from an original total of 650.

Different Bodies Act Differently

When you run over the items on this scale for each body type, you can see that they ring true with your own observations:

- **The extreme fatty** is a very relaxed fellow; he likes to sink limply into an easy chair as overstuffed as himself; he walks like the elephant in a slow, smooth amble. He loves eating and being with people and is therefore a great one for parties. He expresses his feelings easily.

Alcohol makes him even more relaxed, more sociable, more radiant with emotional warmth. When in trouble he seeks out

people—particularly other fatties—and talks it out of his system. He thinks childhood is the best time of life and idealizes the family and mother-love. His sexual drive is low.

- **The extreme muscle man** holds himself erect without effort and walks vigorously with brisk arm and leg movements. He has a tendency to use marked gestures of the head and hands in conversation. He loves physical exercise and physical adventure—in war, exploration, competitive athletics, mountain climbing, wherever he can find it.

Usually he is crazy about speed. If you want to see him really happy, watch him at the controls of a car, a boat or an airplane, eating up time and distance. He also loves to have power over others, and to take unnecessary chances. He likes large, open spaces. Free of doubts, he makes decisions quickly. He is a born executive.

[Continued on page 228]

of entertainment for himself and his fellow workers. After work, he joins the boys for a drink and a few verses of "Mother Machree."

He spends the evening enthroned in his easy chair, absorbing chocolates and television, flanked by family and half the neighborhood.



Commuters May Take a

They'll Whistle Into Ports Like This One in London If Progress Continues.

COMMUTING by helicopter may be coming for suburbanites here and abroad. Cheered by the windmills' military success in Korea, 'copter enthusiasts are busy planning ways to use them in cities.

In England, which probably has more regular passenger-helicopter routes already than any other country, a heliport is proposed for the heart of London. It would be built partly over the busy Charing Cross railway station and extend over the River Thames, as shown in the drawing at right.

Complete with Radar

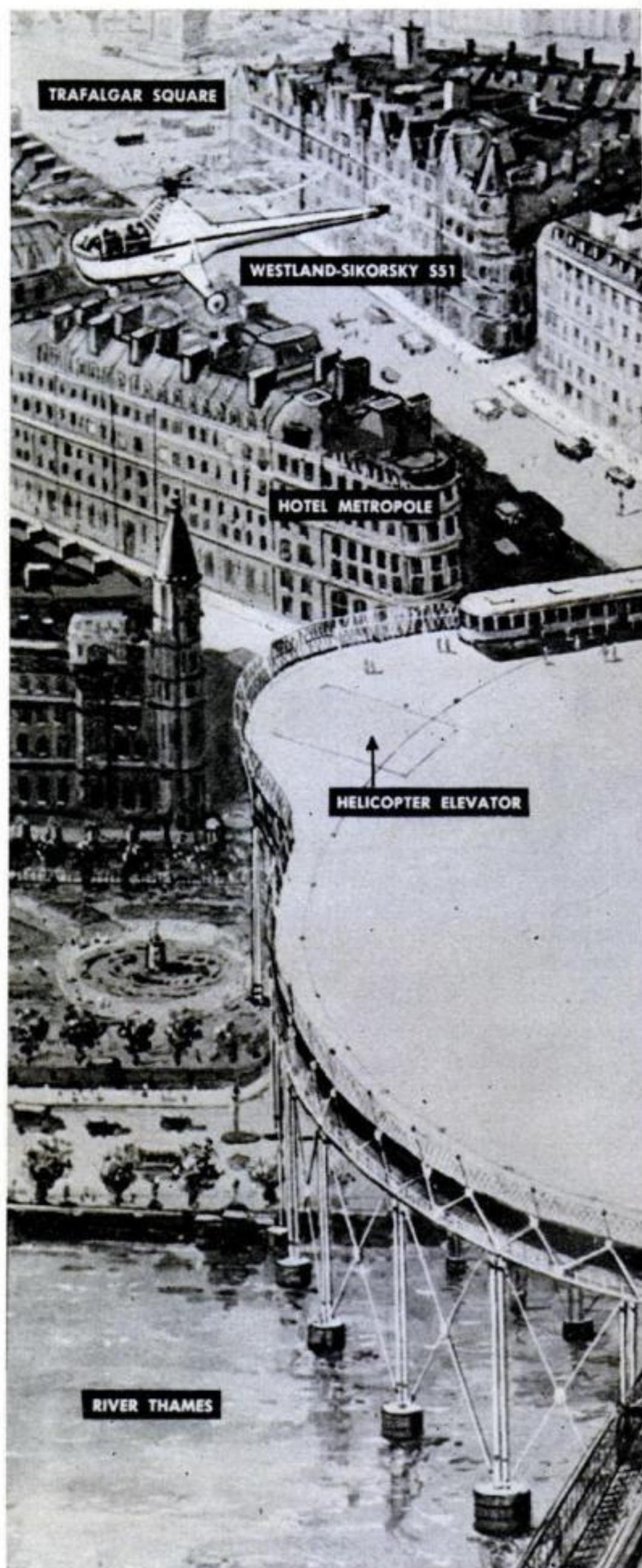
Plans call for an installation as complete as any large airport, including radar aids for landings in London's pea-soup fogs. Elevators would lower helicopters to a hangar deck for servicing. The location was chosen because it provides unobstructed approaches over the river as well as excellent connections to every part of the city by bus, subway and railway (inset, upper right).

The helicopters seen in the drawing represent two types now flying in England. One leading rotary-aircraft builder, Westland Aircraft Limited, also has several advanced models on the drawing boards: the W.80, a 24-passenger helicopter designed for intercity travel and a larger 35-passenger W.81 powered by a twin Mamba gas-turbine unit. Still another, designed for the military at present, would carry 100 troops. With jet power in the tips of a three-bladed rotor, the craft could be redesigned for civilian use.

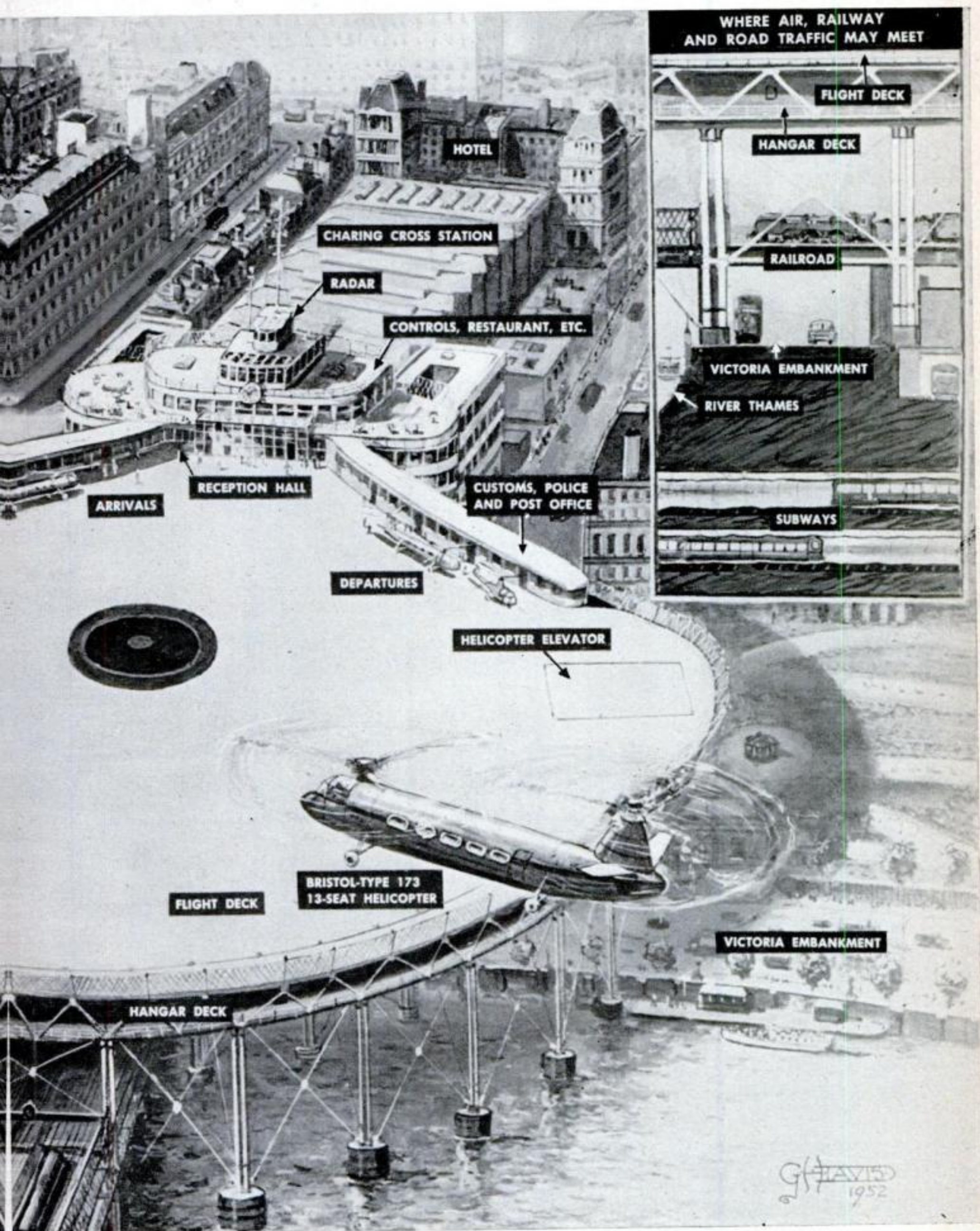
New York to Get 'Copter Service

New York also is preparing for hovering helicopters. For some time there has been local air-mail 'copter service out of Los Angeles and Chicago. Recently the Civil Aeronautics Board authorized a shuttle service between New York's big airports.

Looking for a mid-Manhattan landing site, engineers hit on a Hudson River pier that was being reconstructed. By adding a substructure of watertight concrete boxes, it could serve as heliport and ship dock.



Helicopter to Work Soon



Down the Alaska Highway



on a One-Lung Scooter

When one man and his "tiny vehicle" challenged the world's toughest road, adventure hitchhiked a ride.

By Gardner Soule

IN FAIRBANKS, Alaska, Ronald C. Bulstrode pondered how to get back to his home on Long Island, N. Y. "This," he says today, holding up his broad right thumb, "is a man's ticket to anywhere." Bulstrode has used that ticket often. But under his bed, he decided, was a better way.

Under that bed was a dismantled Cushman scooter. He had bought it for \$100 at an Air Force base in Alaska. He wanted to be the first man to ride a scooter—he calls it a "tiny vehicle"—down the toughest, roughest road in the world: the Alaska Highway, from Fairbanks to Dawson Creek, Canada. He would then, he decided, ride on all the way to Long Island.

When Bulstrode announced he would return home by scooter, the sourdoughs announced they didn't think he would. "The road's too slippery," said one. "It's too rough, too steep and too muddy. I don't think that little thing will get over even one mountain and there are hundreds of mountains. Man, I just wouldn't try."

Bulstrode said he'd try. He pulled his



BACK IN THE STATES, Bulstrode got rid of his beard, added windshield to his scooter.

transportation out from under his bed, put it together and tuned it up. It was the first scooter he'd ever owned, so first he had to learn how to ride it. (This took five minutes.) An oil-furnace repairman at home, he is mechanically inclined.

The scooter's one-cylinder, four-horsepower engine, he had learned, drove the rear wheel by means of a chain. The engine was started by a kick of the right foot on the kicker—an arm with a flat piece at its end. There was no transmission to vary the ratio of engine speed to load. (The automatic

ROAD SIGNS at Fort St. John, Canada (photo at left), show distances to almost everywhere. Below, scooter is parked at border marker between Alaska and Yukon Territory.



THE ALASKA HIGHWAY lives up to its reputation as the world's toughest road. Ice makes it slippery in winter, loose gravel almost as treacherous in summer.



transmission shown on the facing page has been added to later-model Cushman scooters.) The accelerator, on the handle bars, sped up the engine to the point where the clutch would engage as the scooter started out, and slowed down the engine till the clutch disengaged when the scooter slowed to a stop. The total weight of this scooter was 250 pounds.

The engine was under the seat. The rider sat in the seat as in a kitchen chair; he did not straddle as on a motorcycle. This makes it easy to jump off when the scooter slides out from under.

Bulstrode, then 25, went ahead with his plans and packed his gear on the scooter. He knew he shouldn't overload it and he left behind what he could. He carried no water and no food except snacks because he knew general stores were located every 100 miles or so along the road. He took no extra gasoline because the scooter's tank held two gallons—enough, he estimated, for 140 miles—and there would be a filling station near each store.

There were some things that he wanted to get aboard. With methodical care, he managed to squirrel away aboard the scooter: two spare tires, a goose-down sleeping bag, a camera and its flash equipment, two changes of clothing, two pairs of boots, a set of tools (wrench, pliers, screwdriver, etc.), tire-repair kits, tire pump, penknife, can of oil, pair of goggles, three pairs of Indian moosehide slippers, a segment of the toe bone of a mastodon (a prehistoric woolly elephant), eight pieces of teeth of saber-tooth tigers, a desk penholder of mastodon ivory, a package of 12-by-14-inch drawings of the Calgary Stampede (a rodeo) and a moosehide large enough to cover a double bed.

He also tucked in plenty of folding money. Hamburgers were 75 cents on the Alaska Highway, Cokes 25 cents, and gasoline 69 cents an imperial gallon. On August 1, 1950, Bulstrode's brother Eddie left Fairbanks by car for New York. The next day Bulstrode

set out. He was at last alone with his scooter, his equipment, his souvenirs—and his problems.

The chuckholes were among his problems. They were terrible. To avoid them, he had to pilot the scooter on a path like a corkscrew, even on those stretches where the highway is straight from horizon to horizon.

Day after day there was the gravel. There was gravel of large stones. There was gravel of small stones. There was dirt. "The Alaska Highway," says Bulstrode, "is all dirt and gravel."

There was wind. Because he had no windshield on the scooter, the dirt and wind wore away his face despite a beard he had grown for warmth. "The skin on my nose came off first. Then my face went—right down to the meat."

Every mountain was, as the sourdoughs had predicted, a challenge. "They seemed to shout defiance," he says. "When I came upon a mountain, I'd wonder how a one-lunger like

the scooter would ever make it. But I'd get around the mountain, or over it. Somehow." He went over Steamboat Mountain, which requires a steady 14-mile climb, as he went over the others, without having to push once.

Silence Ruled the Nights

The silence was among his problems. It was worse at night. "When I shut off the engine," he says, "I had to cough or make some noise myself to know I wasn't deaf. That's how deep the silence was."

He would go off the road to try to find a level spot for his sleeping bag. Not very far off. "You have to stay close to the road. Either thick forests, swamps, underbrush or something keeps you close to the road.

"When I did lie down to go to sleep, I never heard anything except one noise—something in the distance, like a bump on the ground. It probably was a moose stomping or knocking its antlers against a tree. I never found out. There was nothing else to hear. No cries of animals. No bird calls. Nothing. Nothing. Only silence."

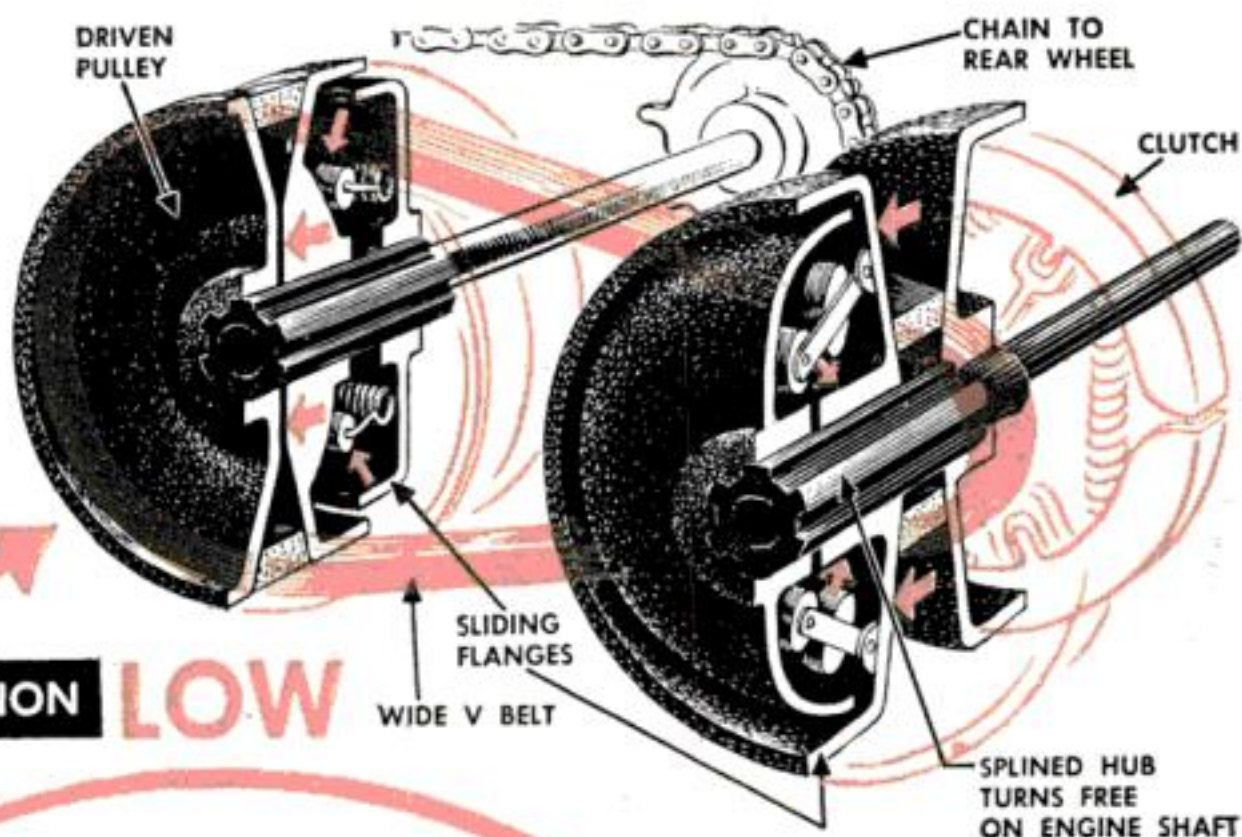
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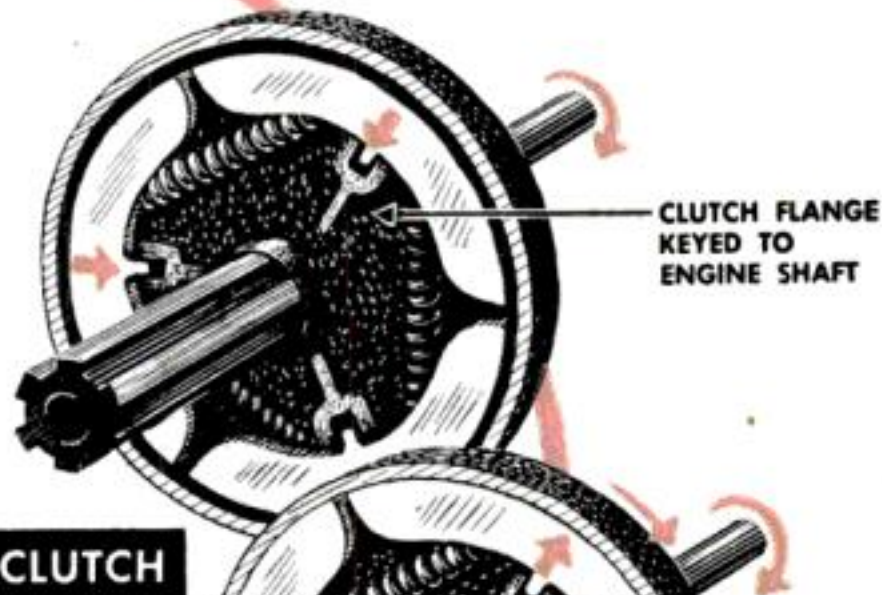
AUGUST SNOWSTORM overtook the scooter rider at Dawson Creek, Canada, terminal of the road, which is marked "Mile 0, Alaska Hi-way." Bulstrode says he looks fatter here because of bulky woolen clothes.

How Automatic Shift Works in New Scooter

TO ALTER RATIO to suit load, Cushman's Varimatic Drive uses two V pulleys, each having a fixed and a sliding flange. Springs normally hold sliding flange of driven pulley in, forcing belt to ride high. At low engine speeds, belt pull holds driving pulley open, so drive is from small to large diameter.

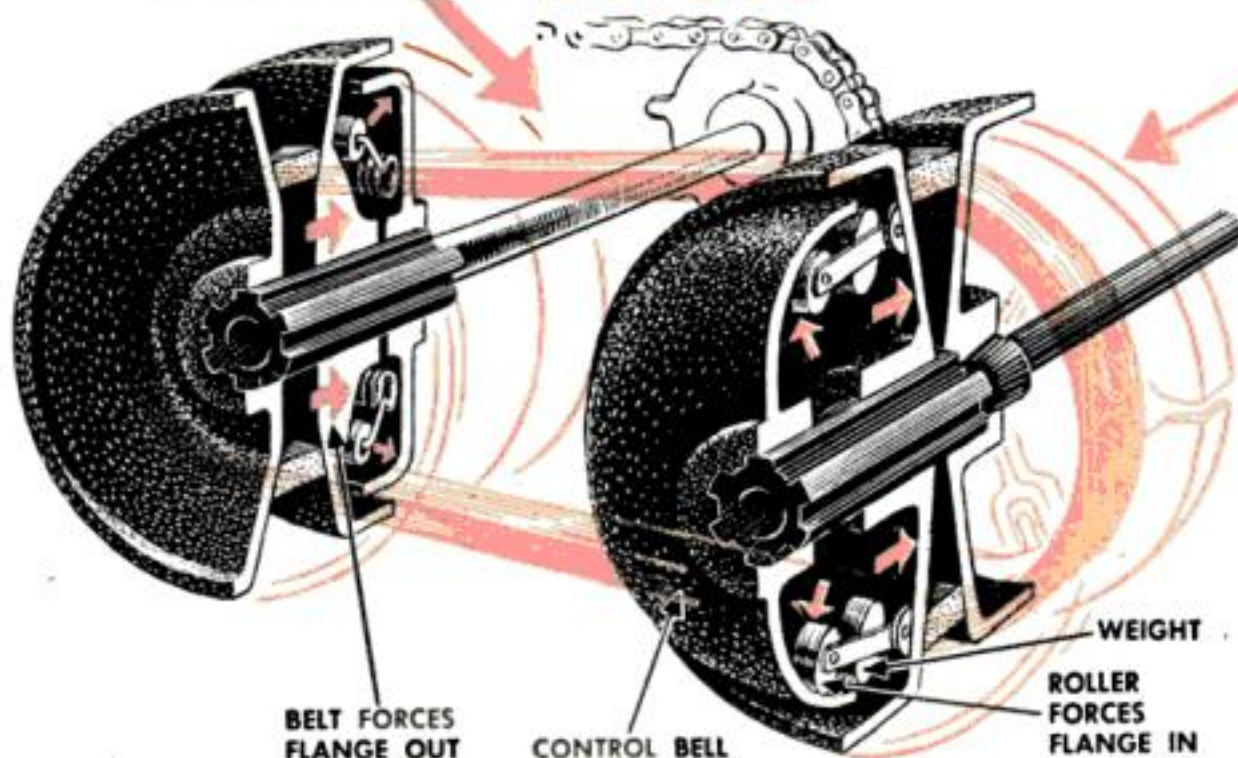


TRANSMISSION LOW



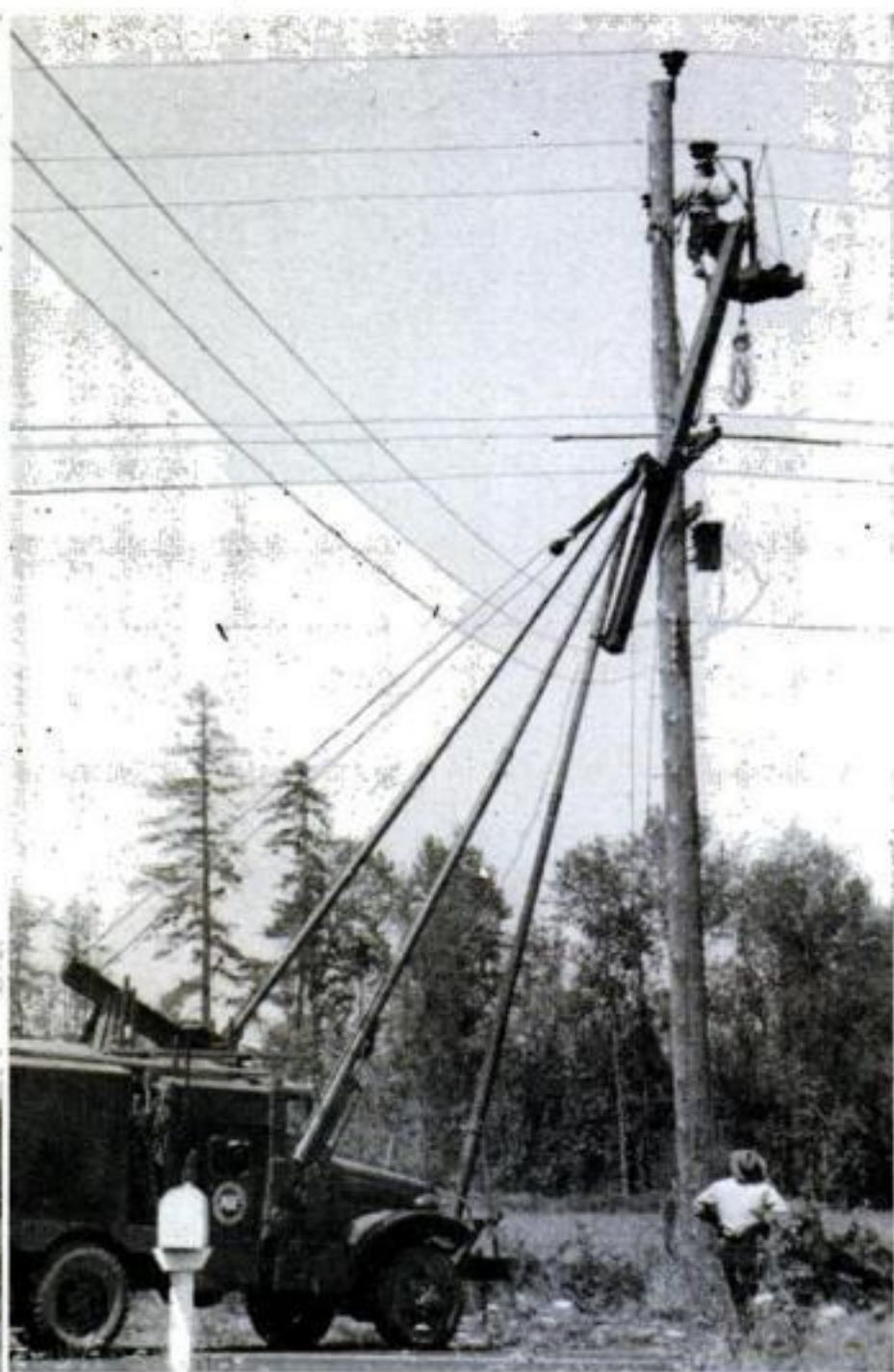
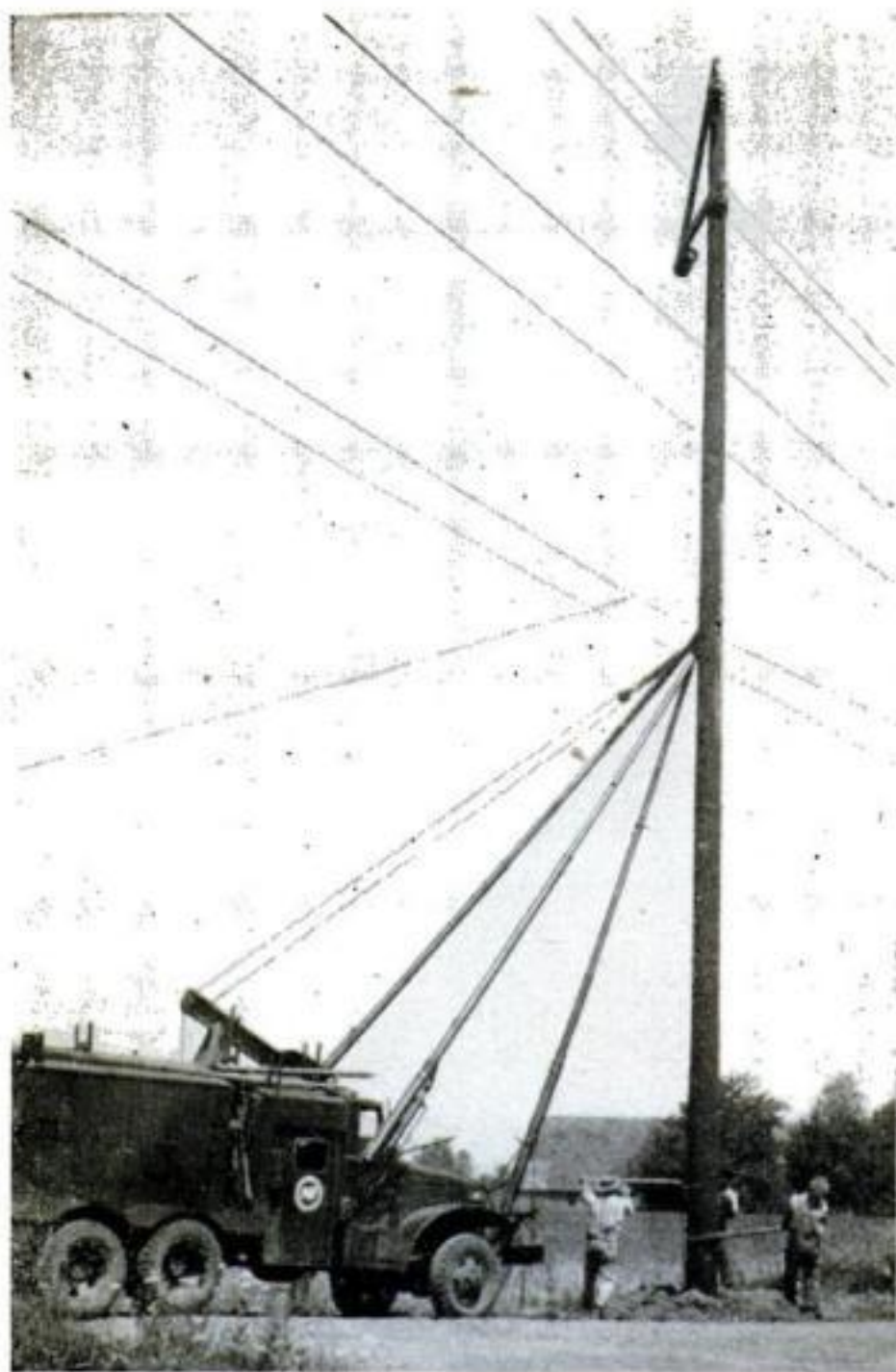
CENTRIFUGAL CLUTCH frees idling engine from drive pulley. Shoes turn freely inside fixed pulley flange until revs go up. Then centrifugal force overcomes springs, and shoes grip rim. Clutch itself does not shift belt.

TRANSMISSION HIGH



AS SPEED CLIMBS, weights pivoted on movable driving flange ride up bell curve, push flange in. Forced high on driving pulley, belt overcomes springs in driven pulley, opens it to ride low. Thus drive is from large to small diameter. If engine speed drops, driving flange will open, and driven pulley close to take up belt slack, shifting back to "low."

AS SHOES EXPAND, HUB AND PULLEY TURN



Long-Legged A Frame Sets Pole

POWER linemen in Oregon swing heavy poles around like sticks with this three-legged A frame mounted on the front of a truck. Two men can put it into action in two minutes. Able to swing 10 feet to either side, it will handle loads as heavy as three tons. The telescoping legs are made of steel tubing. Rising only 11 feet above the ground when traveling, the legs can be extended

hydraulically to 32 feet for hoisting jobs. When a wooden mast is added, as shown in the photo at right, a workman can ride 52 feet up in a bosun's chair.

The frame was built by the Portland General Electric Co. for a wide variety of jobs including pole setting, installing insulators when stringing wires, installing transformers and trimming trees. The truck mounting it carries six linemen in its oversized cab.

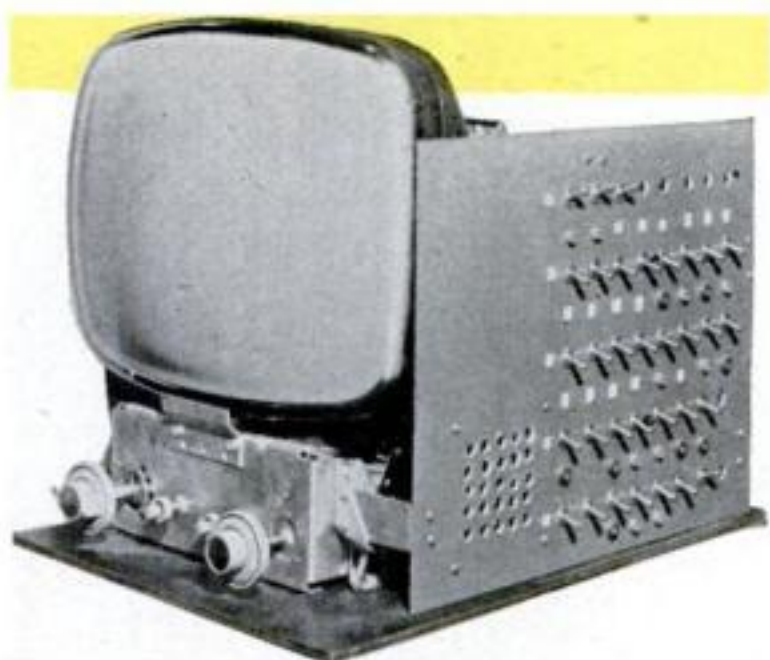
Pads Banish Housemaid's Knee

You won't feel the hard, hard ground when you kneel down for garden digging if you're wearing these knee cushions padded with sponge rubber. Straps hold them in place as you move from spot to spot.

They'll also take some of the discomfort out of other knee-banging chores, such as laying floors or doing a thorough scrub-and-wax job in the kitchen. The Sponge-Eze Co., Portland, Ore., makes them.



What's New on Radio Row



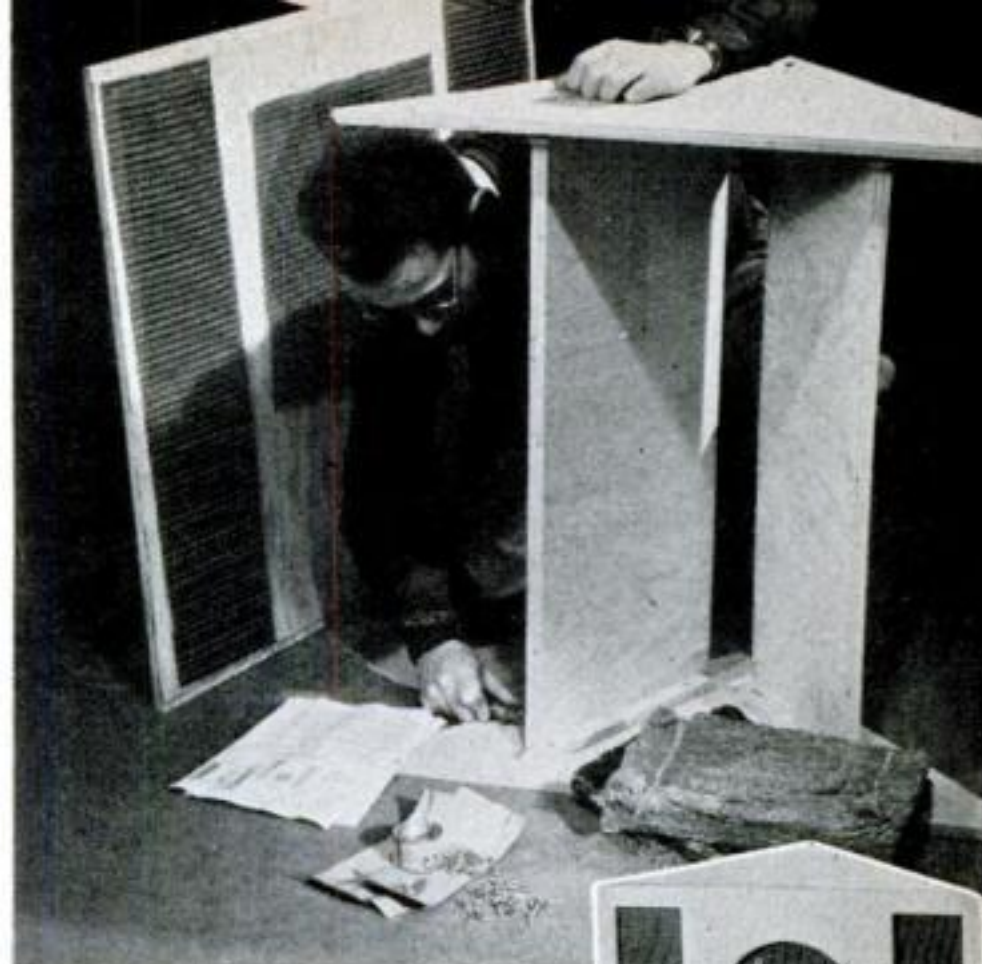
TV Troubles Made to Order

SERVICEMEN can learn to diagnose TV troubles by watching this GE demonstrator show what common set faults look like. Switches and plug jacks connected to the circuits of a standard chassis short out condensers and resistors and cause other circuit changes. The screen pattern below, one of 33 that can be produced, shows horizontal tearing produced by an off-value resistor.



Tube Shatters Television Set

You see at right what can happen when a picture tube implodes. An implosion is like an explosion but force is exerted inwards by air rushing to fill a vacuum. In this case it shoved in the 3/16" safety glass and bounced tube fragments around with enough force to bend some metal parts. Luckily tubes don't implode often, but this photo shows why servicemen are warned to handle them with gloves, goggles—and care.



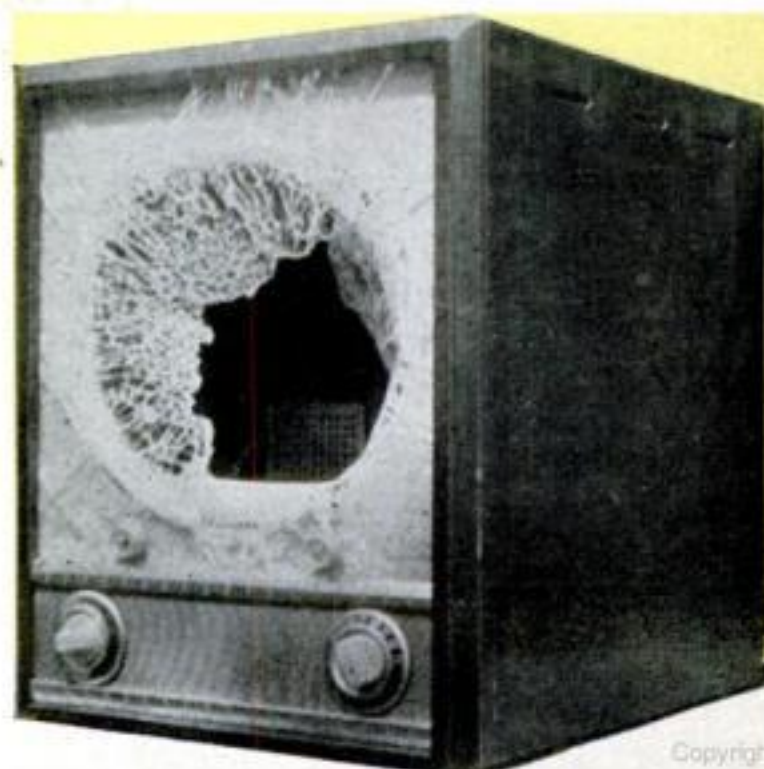
Speaker Cabinet Built from Kit

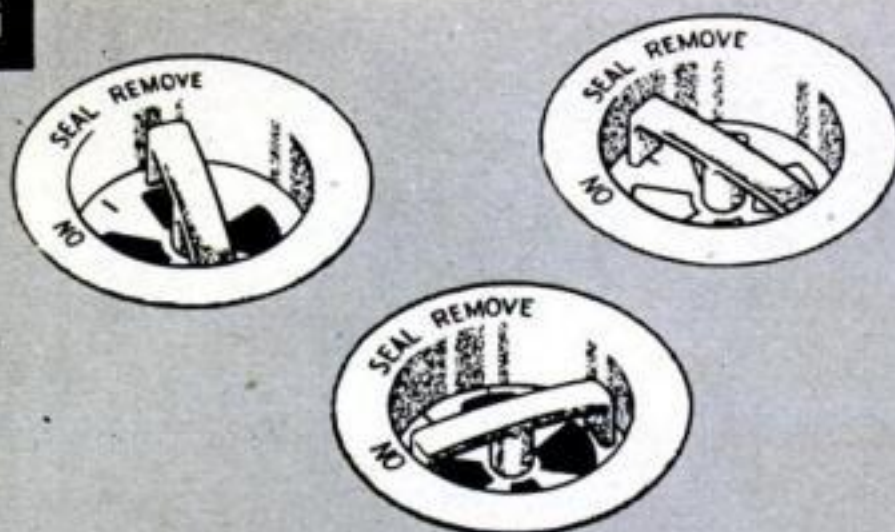
You can make a good loudspeaker cabinet without knowing anything about acoustic theory just by putting together the pieces in this kit. They are cut and drilled and arranged for easy assembly into a "folded-horn" speaker box. It fits a corner and uses the walls as acoustic extensions of the speaker. The kit costs less than half as much as a finished cabinet. G & H Wood Products Co., Brooklyn.



Mike Broadcasts Through Radio

THE microphone at right broadcasts through a radio, turning the set into a public-address amplifier or intercom. The Micro-Vox, sold by Johnson Smith & Co., Detroit, needs no connection to radio or power line.





A THREE-PURPOSE CONTROL at the sink-drain opening is common among garbage disposers. Control shown is GE's Twistop. At Remove the top is a strainer, which is lifted off when the housewife is ready to load the grinder. At Seal it is a stopper. At On it is locked in place, awaiting a sufficient flow of water to start the disposer grinding up waste.

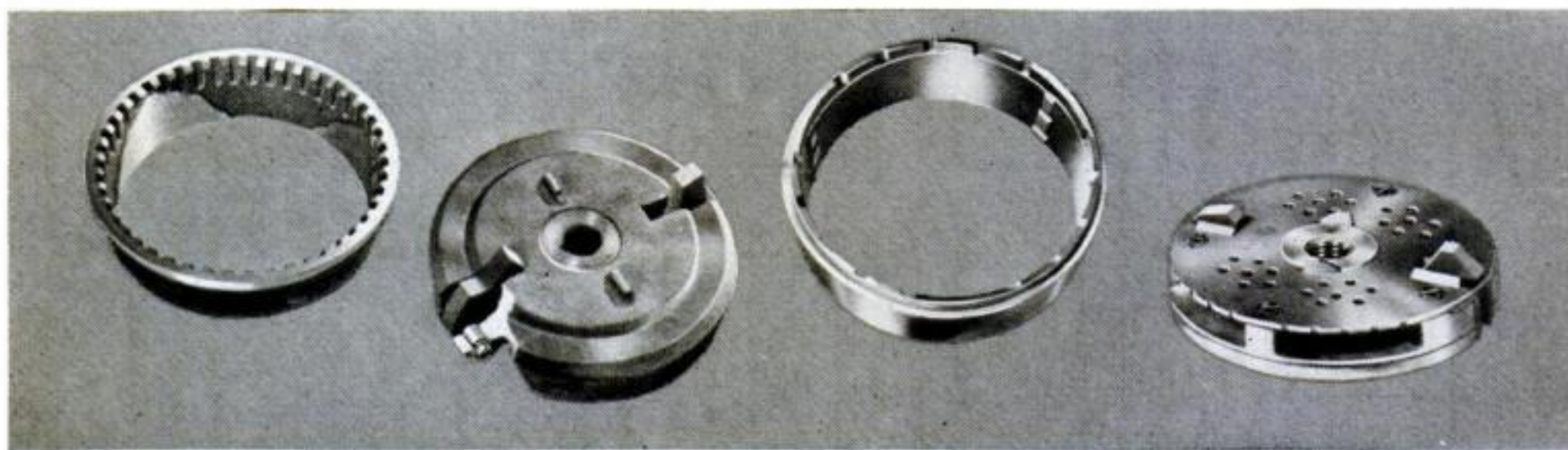
How a Garbage Disposer Works

ANY man who has known the dismay of having a bottom-soaked bag of garbage give way in his hands and shower him and the floor with coffee grounds, wilted lettuce and eggshells is inclined to regard the electric garbage disposer with warm gratitude. This emotion runs highest in Los Angeles, which leads all other U.S. cities in the number of waste-disposal units installed in its homes—more than 200,000. But the feeling is sufficiently widespread to have caused manufacturers to turn out between 300,000 and 400,000 garbage disposers during 1951.

There are several makes, but they are fun-

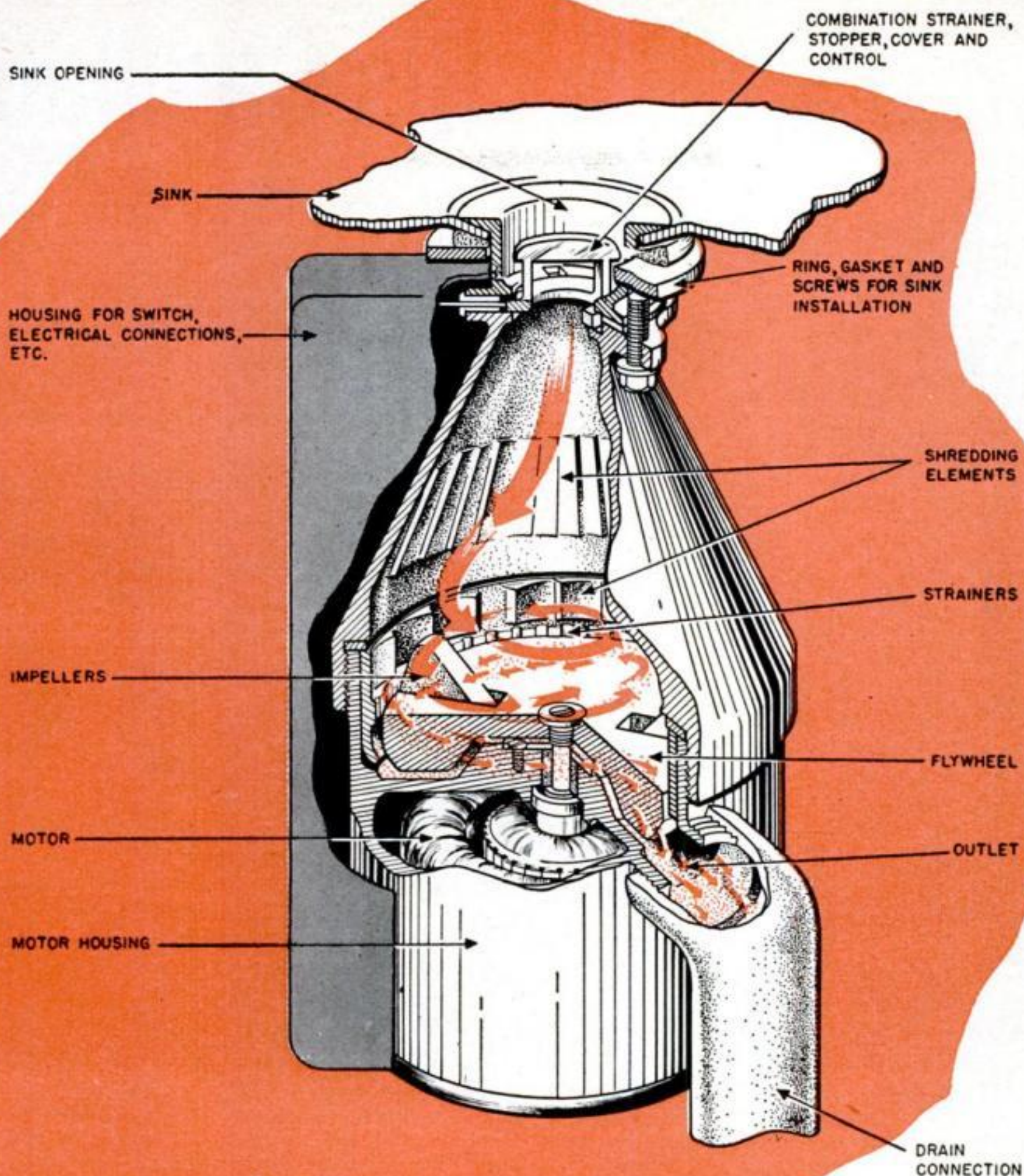
damentally alike. Each one fits under a kitchen sink, receives food scraps through the drain opening, grinds them fine and sluices them into the sewer or septic tank. (Septic tanks must be large or cleaned often.) Each makes a certain amount of noise at work, but most householders who use one find this easier to take than the old-fashioned process of filling, emptying and cleaning a garbage pail.

Most electric garbage disposers are designed for sinks with a drain opening three and a half to four inches wide, which is standard. The two best known makes have a



WORK HORSES of any electric garbage disposer are the flywheels, with their impellers, and the shredders. Shown here disassembled

are the shredding rings and the flywheels of Westinghouse's Waste-Away (left) and General Electric's Disposall (right).



flow switch, connected with the cold-water line to the sink. The flow switch won't let the grinder operate until cold water from the faucet is flowing into it at the rate of one and a half to two gallons a minute.

The diagram above combines features of these two popular makes. It shows how the flow of water pushes the garbage down against the flywheel, which, with its impellers, hurls the waste at the shredding elements until it is small enough to go through the strainers and into the drain.

Some cities and towns won't permit garbage disposers, claiming they overtax the sewers. On the other hand, Jasper, Ind., has practically forced residents to buy them—but at a discount.

The average garbage disposer will calmly dispose of peelings and pits, eggshells, coffee grounds, small bones and corncobs. It will balk at shells, string, fish skins, cans, jars, broken glass and crockery, and large bones. Large bones, quite properly, still go to the family dog.

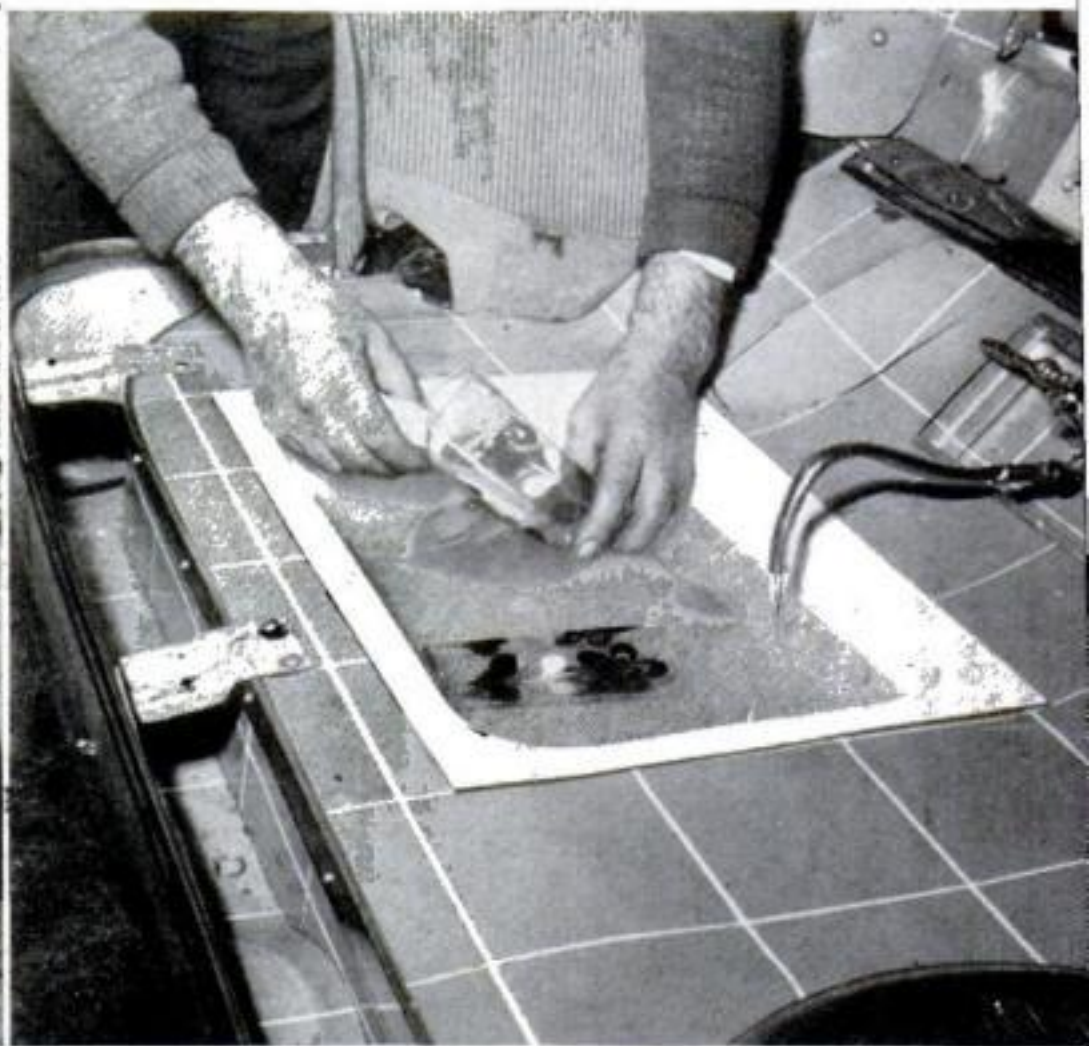
END



His Cadillac

ROLLING along California's highways, Louie Mattar's light gray Cadillac looks strictly stock—but when you peer inside, your eyes pop.

Its owner dines on meat grilled in a built-in electric barbecue and quenches his thirst from a drinking fountain in the right rear fender. He washes dinner dishes in a kitchen sink and does laundry with a pow-



SHOWER, one of homelike conveniences of made-over '47 Cadillac (inset), screws into front fender. Electric pump supplies hot water from coils around exhaust manifold.

KITCHEN SINK big enough to do dinner dishes has running hot water and is surrounded by linoleum tile. It's hidden away beneath right-hand side of rear-seat cushion.

TURKISH WATER PIPE is installed on dash for owner to puff on whenever he wants. Miniature bar, also on dash, has separate faucets for dispensing whisky, soda and water.

MEDICINE CABINET, with mirror and electric shaver, hides behind back cushion on right-hand side of rear seat. Cabinet is over sink shown in photo directly above.



Has a Kitchen and Bath

ered washing machine. He bathes beneath a hot shower. For relaxation he may smoke his favorite Turkish water pipe, enjoy a highball from a miniature bar and listen to wire-recorded music of his native Lebanon from a pair of speakers. He uses a microphone connected to the speakers to call his three children. Secret of his supply of power for all these conveniences is a pair of

submarine-type storage batteries, which delivers ample six-volt current.

To date, Mattar, proprietor of a service station in San Diego, has spent \$7,000 on extras, and he's still thinking up new ones. Coming next, he says, will be a bathtub beneath the front seat.

Mattar won't install a bed though. For sleeping, he still prefers hotels.



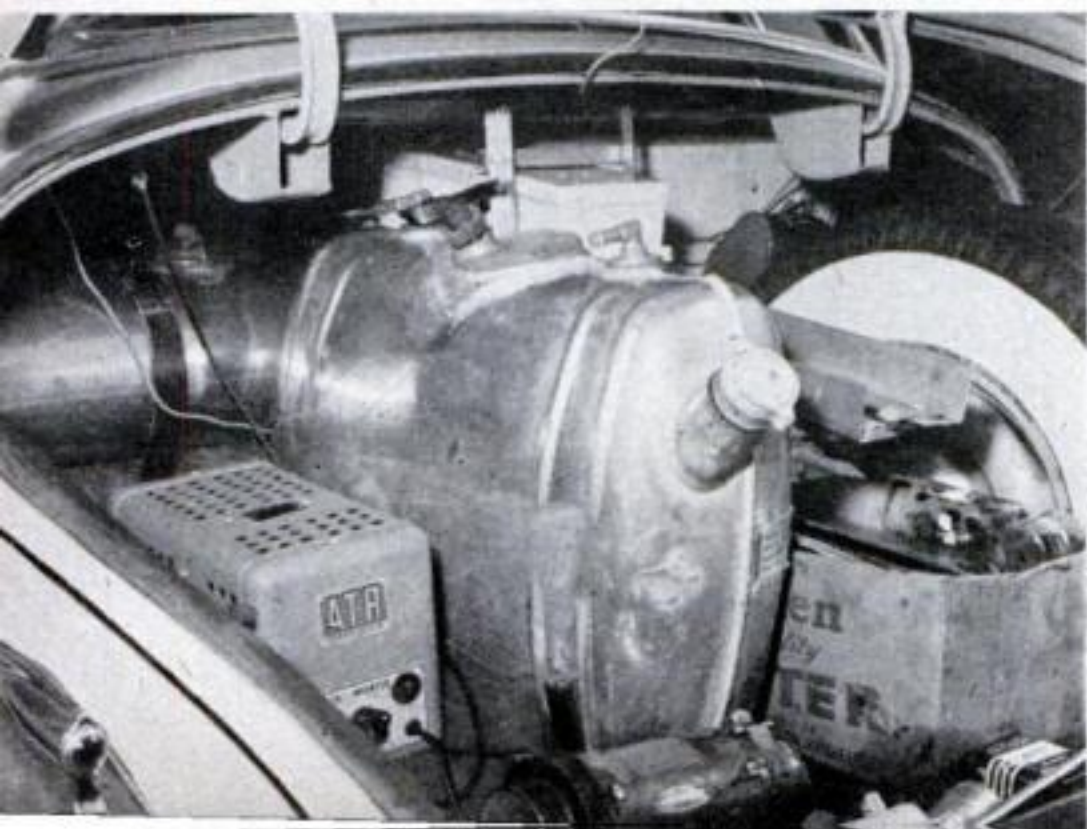
BARBECUE PIT large enough to cook six wieners slides out when armrest at center of rear seat has been lowered. Insulation keeps food warm after current is turned off.



WASHING MACHINE, beneath left-hand side of rear-seat cushion, has tiny homemade wringer cut down from a standard model. Lid of "home laundry" contains electric power unit.

WATER comes from four tanks holding total of 50 gallons. This airplane tank in trunk contains 20 gallons. Other cold-water tanks are beneath car, hot-water supply under hood.

DRINKING FOUNTAIN, operated by pressing button, is under metal cover on right rear fender. Enough water is stored in car's tanks for several baths and plenty of drinks.



Aids to Modern Living



TV-Stove. A housewife can follow telecast cooking instructions step-by-step on the TV set built into this electric oven. A clock and an oven timer flank the screen. *Western-Holly Co., Culver City, Calif.*



Baby Shower. Attached to the walls of a stall shower, this removable hammock lets mother bathe baby without crouching over a tub. A hose attachment gives a gentle spray. *Henry Weis Mfg. Co., Elkhart, Ind.*



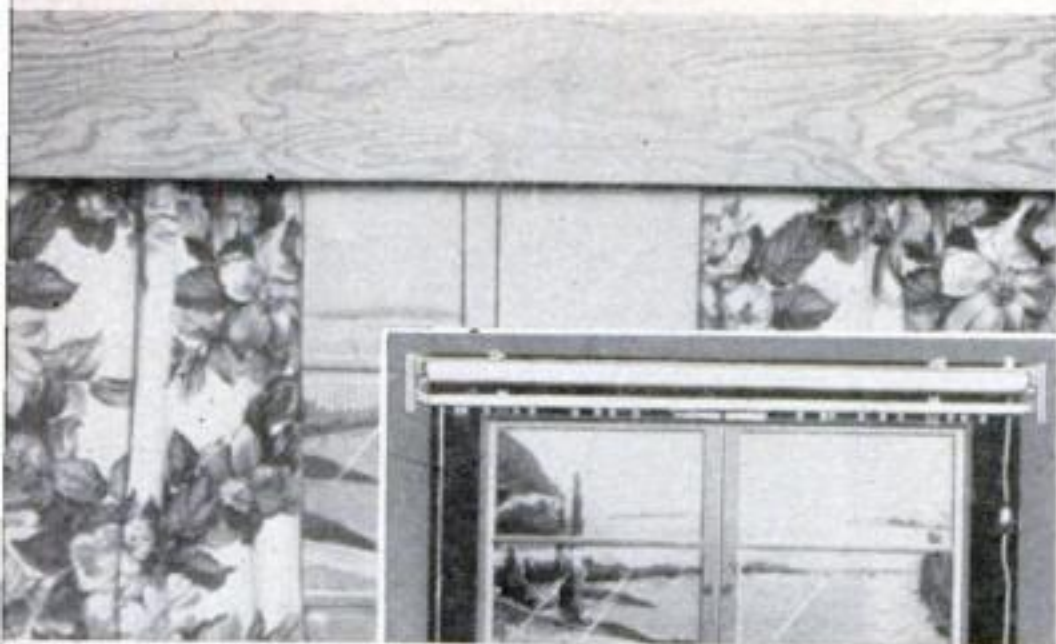
Iron Empties Easily. You can leave the water in until this steam iron cools, then empty it like a tea kettle. Water pours off through a spout at the nose. *Casco Products Corp., Bridgeport, Conn.*



Plastic Bag. Two pleats running across the bottom and up the sides of this bag are said to make it strong enough to tote 50 pounds of groceries. *Danae Creations, Minneapolis.*



Arm-Power Cultivator. The garden tool above gets your whole arm into the act, not just your wrist. A nylon band fastens upper handle to arm; sponge-rubber pad eases pressure. *Dreer's, Philadelphia.*



Illuminated Valance. With a fluorescent-lighted valance hung over windows you get indirect lighting without expensive installation costs. *Joleco Corp., St. Louis, Mo.*



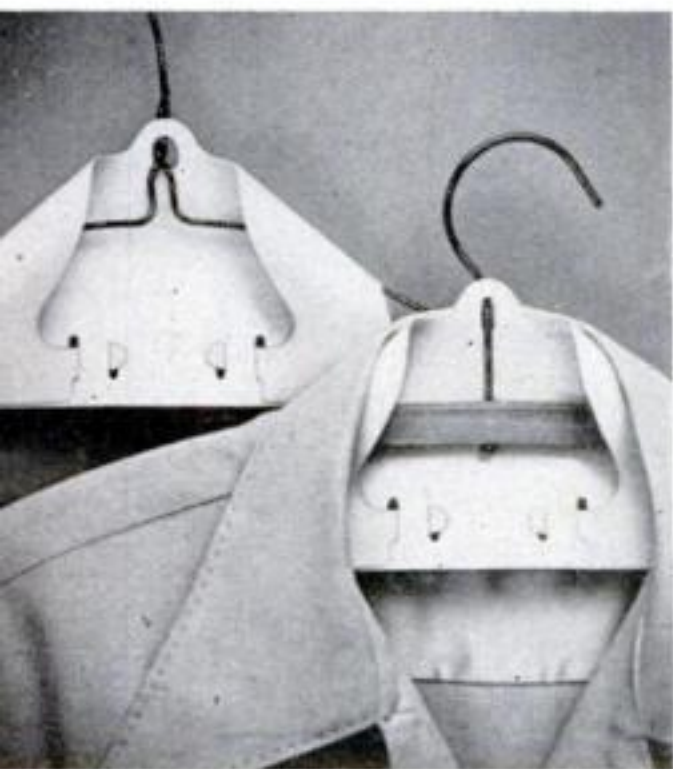
Air-Powered Polisher. This appliance for polishing, waxing or scrubbing floors runs on air from any tank-type vacuum cleaner. *Beal Speed Polisher, Portland, Ore.*



Hose Holder. Where deep soaking of soil is necessary, a spike hose support will release you from a tedious job. It fits any garden hose having a $\frac{3}{4}$ -inch thread coupling. *Sunset House, Hollywood.*



Rare Jewelry. Cuff links and earrings are now being made from ancient coins. Aurei of Nero, mounted, sell for \$475. For \$1,000 you can have rare, gold Greek staters. *Numismatic Gallery, Beverly Hills, Calif.*



Collar Guard. Clipped around wooden or wire hangers, these plastic guards keep collars gently rolled and prevent wrinkles. *Kempfert-Bowman Mfg. Co., El Monte, Calif.*



Convertible Cart. Just replace the collapsible basket with a tray and this laundry cart serves as a tea wagon or a portable bar. Base folds for storage, too. *Dennis Mitchell Industries, Philadelphia.*



Knitters' Slide Rule. This computer tells how many stitches to cast on for any number of inches up to 100, using any yarn from four to nine gauge. *Progressive Enterprises, Los Angeles.*

MORE Aids to Modern Living



Kitchen Ventilator. Cooking odors are removed at the source when the fan is built into a cabinet hung directly over the stove. Lifting the hood starts the motor. *Lyon Metal Products, Aurora, Ill.*



Rain Pants. These plastic protectors will keep trouser legs dry and in press on rainy days. *Sta-Dri Products Co., N. Y. C.*



Adjustable Glasses. The wearer of bifocals won't have to squint down his nose or peer over the glasses if lenses are set in this frame. An extra bridge on the nosepiece allows lenses to be lowered for distant vision (left above), raised for close work (right). Finger push (center) adjusts them. *Page Optical Specialties, Hollis, N.Y.*



Bean Pot Electrified. Here's an electric cooker that slow-bakes beans or simmers stews, soups and casserole dishes. The ceramic pot lifts off the heating unit for washing; the unit doubles as a hot plate to keep any food piping hot for serving. *West Bend Aluminum Co., West Bend, Wis.*

How You Become a Frogman

You have to be rough, tough and ready to risk your life either under the sea or on enemy beaches.

By Andrew R. Boone

CHILLED to the bone, seven young sailors with oxygen bottles strapped to their backs walk slowly along the bottom of the Pacific Ocean, 100 miles behind Communist lines. One scoops up a fistful of sand, noting its texture on a slate fastened to his right leg. Another almost bumps into a mine. Consulting his compass and watch, he writes down its location. Others chart reefs and sharp-edged obstacles that would rip into the bottom of landing craft.

After an hour, the seven surface at their appointed offshore rendezvous. They climb into a waiting rubber boat and paddle silently out to their mother ship, lurking in the

A FROGMAN'S most important job is demolishing enemy installations either underwater or on land. Trainee below sets off TNT practice charge on beach at Coronado, Calif.



darkness off the Korean shore. Following a brief report to their skipper, the men move shoreward again. This time they carry sacks of TNT and necessary detonating equipment. Soon their buoyant boat bounces over the breakers smack into enemy territory. Silently they crawl ashore to stack explosives under the timbers of a railroad bridge and at the entrance to a tunnel. Minutes later several blasts disrupt that line for weeks to come. By now, the daring sailors are shrouded in the sea's blackness, paddling like mad toward the mother ship.

The Sneak-and-Wham Boys

The Navy speaks of them as a UDT—Underwater Demolition Team—better known as frogmen. Theirs is the Navy's toughest job, to sneak and peek, then wham and scam. They get the first close-up of enemy beaches and shore installations. Often, since paddle-footed commandos preceded D-day assault troops onto Normandy, frogmen have cleared the way for army troops and marines to hit enemy shores. They get their name from their water green exposure suits. From a distance they resemble bullfrogs.

For his hazardous and daring performances, the frogman draws 50 bucks a month extra pay. How does he get that way?

Let's say you are an enlisted Navy man with at least two more years to serve. You meet a frogman or hear through the grapevine of his exploits. You write the Bureau of Personnel in Washington, volunteering for UDT training. If you are between 18 and 35, the bureau may give you a tentative go-ahead. You must be the type who wants to stick his neck out.

Qualifications Are Rigid

Are you qualified? That depends upon several things. If you're an almost perfect physical specimen, require no medical attention, are not afflicted by claustrophobia—fear of being confined in small space—and have no fear of water and explosives, you may get a chance. If tapped for the opportunity, you will have to take about 15 weeks of the toughest training imaginable at one of two Naval Amphibious Bases—Coronado, Calif., or Little Creek, Va. If you finish the course successfully, you win your fins. Chances are about even you won't make it. You may lack adaptability, a strong will—or plain guts.

You start as a polliwog. UDT commanders don't care too much whether you're a quali-

fied swimmer at the outset. In a few weeks, however, you will be swimming two miles through surf and rollers, and varying distances under water. You must swim noiselessly without telltale splashes that would reveal your position to the enemy.

For the first two weeks you swim in a pool. Endlessly you practice three strokes: side, breast and back. "Stop splashing," shouts a hard-bitten instructor, "want white water to draw fire?" Silence and invisibility will be your best defense.

The third week you are assigned to a boat crew, one of seven men. Holding overhead a 250-pound inflated rubber craft, you walk into the crackling surf and launch the boat. Then—on purpose—you capsize it, and right it again in the swells. You swim short distances, distances that will lengthen day by day. By night you practice infiltrating "enemy" camps, then you paddle out to sea to place explosives around shallow-water obstacles that duplicate those you'd encounter on some foreign shore.

Worst Tests Come in Hell Week

Five weeks pass. The sixth is Hell Week. Each morning you roll out at 5:45, gobble a light breakfast, set out on a one-mile run through the sand. Next comes a two-mile swim; an hour of judo training, sentry stalk-



INFLATABLE rubber boat is used by Underwater Demolition Team to sneak ashore at night. Frogmen must learn to right boat if it capsizes, handle it in heavy seas.



AFTER "EXPLODING" beach defenses, frogman returns to his sea-going boat. Hooking onto

a line looped around a wooden block, he is hauled aboard craft by another frogman.

ing and infiltration; and another one-mile run. You top off these wearying activities—after lunch—with another hour of calisthenics, a round of some competitive sport and a run through an obstacle course.

You end each day's round so weary you can barely walk from dinner to your bunk. You're dreaming of a soft berth when—wham!—a whistle blasts in your ear. It's 10 o'clock and time for a forced march of 15 miles, half of it through knee-deep water. You hit the sack again at four, making the 5:45 reveille a hollow joke. Well rested, beef-fed instructors have another go at you after you breakfast on K rations.

One of your buddies is cut by barnacles, another struck by a sting ray—a sea creature that inflicts painful wounds. Some fall by the wayside, but none gives up voluntarily.

These problems are but a warm-up for Hell Week's last evening—a fine way for a sailor to spend Saturday night.

Promptly at nine your class lines up on the beach near headquarters. On signal, you shoulder your boats and run one-half mile to the ocean. Launching them, you stage a swift 7½-mile race to Fort Emory, portage across the narrow sandy strand and race back through San Diego Bay, checking at seven stations enroute. Arriving at "Pickle Island," a weed-swathed stretch of rocky beach, you portage to a jetty, launch the boat once more, then paddle to the original take-off beach. You polliwogs cover 19 miles this night.

Windup Is Demolition Study

You've had a taste of combat operations. Comes now cold-water swimming. For 10 weeks you plunge into the sea repeatedly. The fins feel awkward at first, but soon you get the feel of these appendages. They help propel you faster. You tackle the surf, outbound and inbound, plunging outward

10 Swimming Tips from the Frogmen

- ▶ Learn to swim from an instructor, preferably in a pool.
- ▶ Never swim until weary, for your muscles may give out.
- ▶ Do not swim within one hour after a hearty meal.
- ▶ Never swim alone. Cramps are dangerous.
- ▶ Do not splash others, especially beginners, for they may choke or become panicky.
- ▶ Swim out from shore line only half the

distance that you think yourself capable of.

- ▶ Swim in the sea only under the eyes of a lifeguard.

- ▶ To enter the sea, go out under the breakers. This takes less effort than fighting their incoming crests.

- ▶ To land from the sea, ride the breakers. Make like a surfboard.

- ▶ Use the stroke you like best. It's less wearying.

under the breakers, riding them in like a surfboard. The cold penetrates to your bones, but gradually you accustom yourself to the near-freezing temperatures. You lengthen your swims, until at last you surpass considerably the two-mile requirement. Explosives lose their mysteries. During the final week you practice demolition techniques so secret not even the rest of the Navy knows about them.

You manage to survive the killing routine, purposely so rough that only the toughest

can take it and come back for more. You win your mythical fins, but get no badge identifying your service. There are fewer than 250 frogmen qualified to wham an enemy shore and scam to safety, and the Navy doesn't want them easily identified. You will serve with one of five UDT outfits. But who's lucky, you or the guy who flunked? That depends upon the point of view. Some freezing black night when you ease from a rubber boat and start swimming toward an almost invisible enemy shore, you will find out. **END**

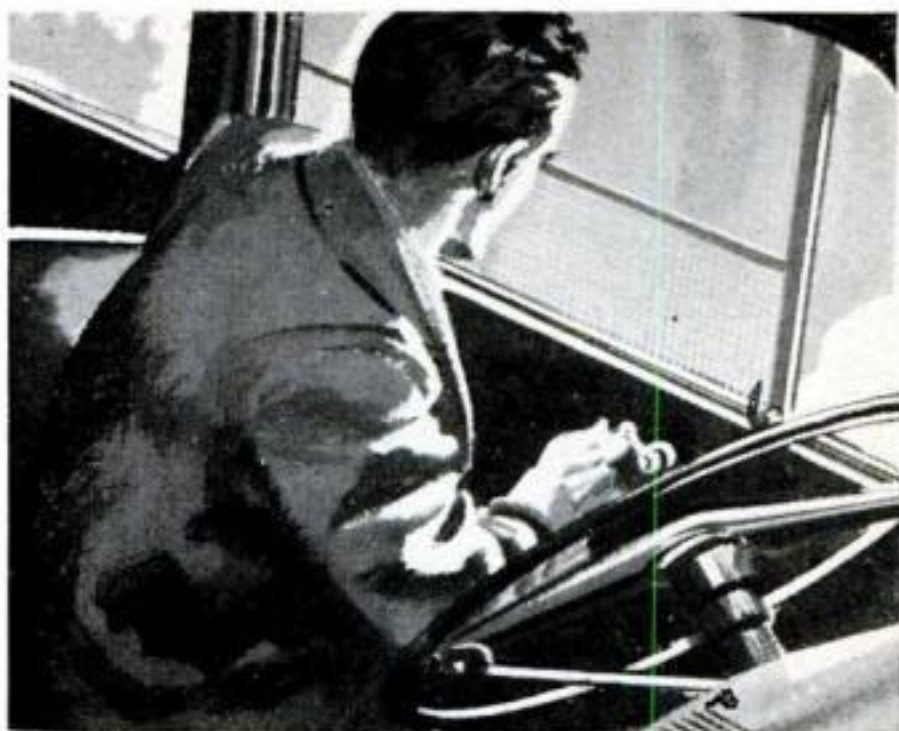


STUDENT FROGMEN set TNT charges in ocean to destroy hedgehog obstacles—sharp-edged

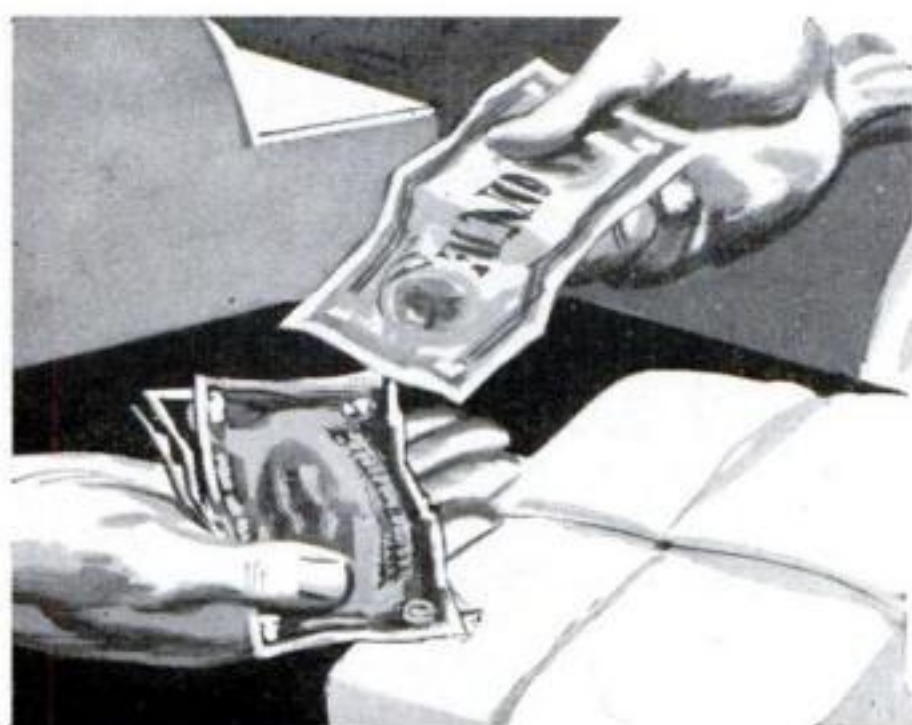
angle irons, arranged in the shape of a triple X, that cut into the hulls of landing craft.

I'd like to see them make...

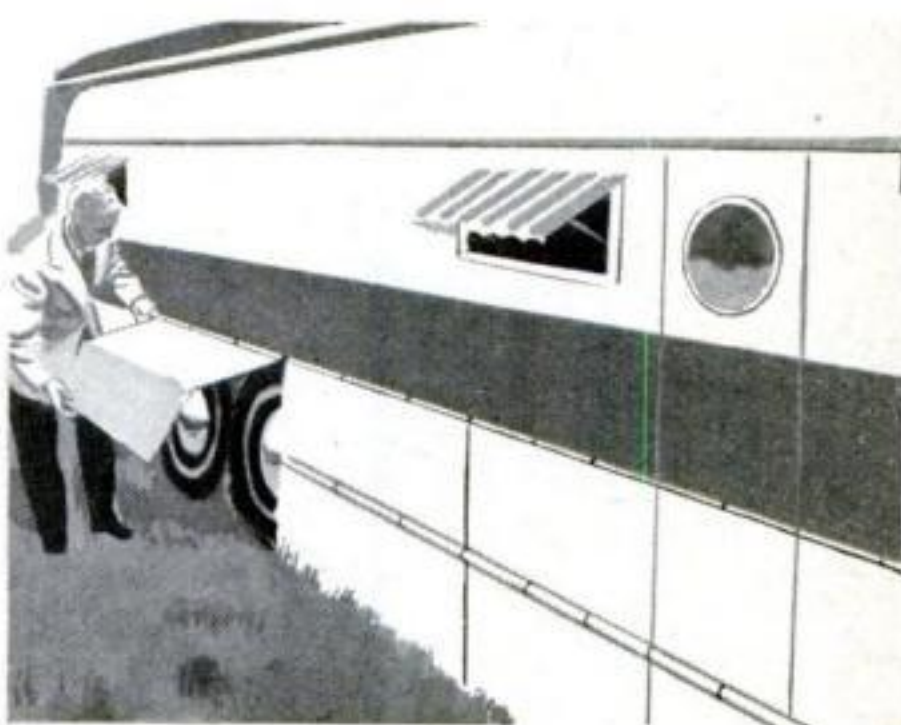
Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay \$5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



ROLL-DOWN SCREENS FOR CARS so salesmen and shoppers wouldn't have to leave their cars all buttoned up during hot summer months.—*S. P. Wiener, So. Norwalk, Conn.*



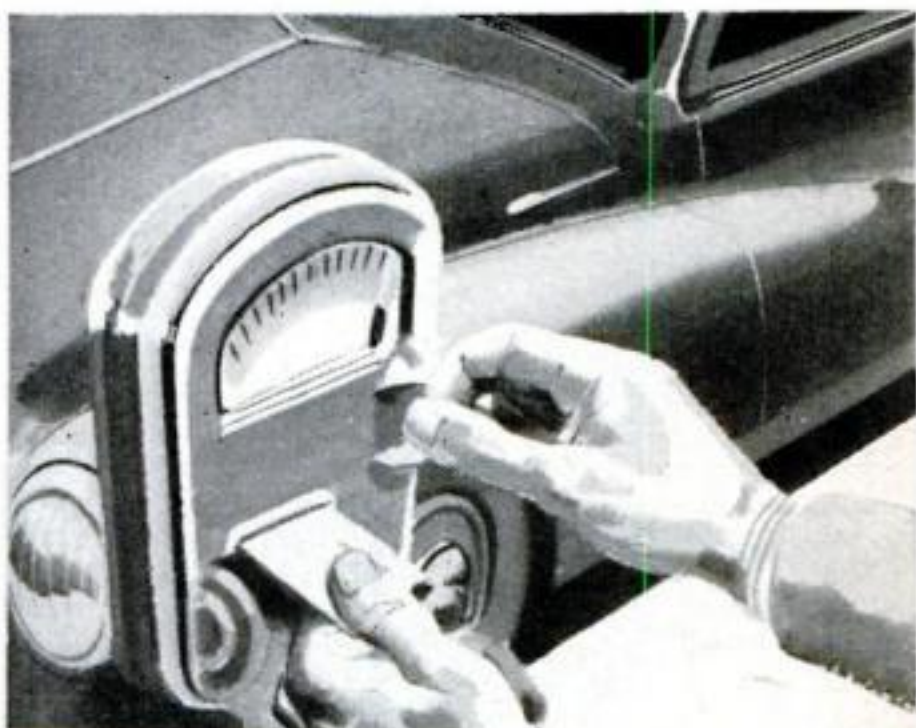
PAPER MONEY IN DIFFERENT COLORS, one for each denomination, for quick identification and prevention of costly mistakes.—*Herbert E. Fey, New Braunfels, Tex.*



SIDE PANELS FOR TRAILERS. You could pull them down when you parked vehicle, making the base more attractive and shutting off drafts.—*Mrs. R. C. Armstrong, Lafayette, Ind.*



A FOOT-OF-THE-BED ROLLER like a window shade. You could pull up the quilt when cold, let it rewind automatically when you didn't want it.—*W. Scheel, Bloomington, Ill.*



A DEVICE ON PARKING METERS which, when a coin was inserted, would eject a card showing when your parking time would run out.—*John D. Sterringer, Lancaster, Pa.*

You Can Really See Out of a Kaiser

The '52 Kaiser combines classy lines with sassy performance in a car that's as easy to look at as it is to look out of.

By Wilbur Shaw

WHEN Henry J. Kaiser decided to break into the automobile-manufacturing business after World War II, he bit himself off quite a chunk to chew. No major effort like this, in competition with long-established companies, had been made since Walter P. Chrysler barged into the business in the early 1920s.

I've just had a chance to see how Henry is doing after six years. I've driven the 1952 Kaiser.

The Kaiser is a conventional car. I remarked on that on my recording set as I slid behind the wheel of a four-door sedan, equipped with a Hydra-Matic transmission, at the Kaiser-Frazer factory in Willow Run.

There were all sorts of stories . . . right after the war . . . about what this new

brand of car was going to be like. For one thing, we heard that it would be a front-drive affair. Well, Henry didn't desert the beaten path when the Kaiser and the Frazer finally came out . . . he was wise . . . the public doesn't cotton to the unusual. Anyone who gets too revolutionary sticks his neck out a mile.

I liked the car, even before I fired up. The visibility was superb. I want to emphasize that. A British automobile critic has written that the Kaiser windshield is a broad bay window. And the hood is low.

You See Where You're Going

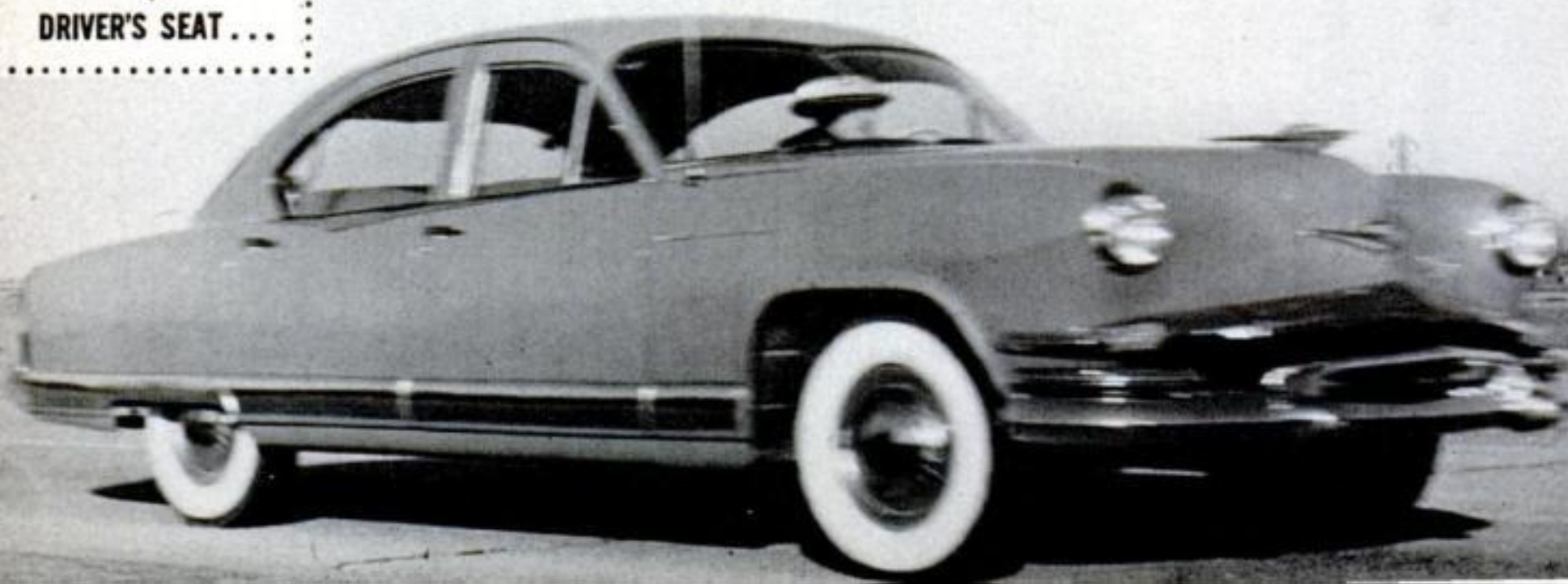
With a measuring tape I counted off how close a driver could see in front of the car. Over the top of the hood a medium-sized man can see the road as close as 15 feet seven inches ahead of the front bumper.

REPORT FROM THE



DRIVER'S SEAT . . .

Visibility from the Kaiser is eloquently illustrated by this picture. The camera could see right into the driving compartment and identify me as I made a speed run on the Detroit Expressway. Chrome for dressing up doesn't seem lacking, but I suspect defense needs have thinned it out.





Looks just like I'm sitting out in the open, doesn't it?—except for that low mirror, of course.

Looking through the crease between the left fender and the hood, he can see it to within 11 feet three inches ahead. That is a commendable safety feature.

I started the engine with the ignition key. That's new. No starter button on the dash.

There are some other new items—a one-

piece curved windshield, a refurbished front end and hood ornament, and a restyled rear bumper, rear-deck handle, rub rail and interior trim combinations. Rear springs have been softened, a wider brake pedal goes with the Hydra-Matic transmission, and both the front suspension and the front

The spare is sunk in a well in the trunk. I found the luggage space a little skimpy. Outside rear-deck hinges enhance the car's appearance. K-F has discontinued the Frazer.

For an L-head, the engine has a lot of sass. The upper piston rings are chromed. This prevents scuffing and permits greater tension on the cylinder walls without added friction.



shocks have been re-engineered this year.

The engine is quiet . . . there's the slightest tendency toward vibration at idle . . . but I've never driven a six-cylinder car that didn't have that. The Hydra-Matic quadrant is conventional and—as she starts off now—the gear engagement is smooth and soft.

My proving ground was the high-speed Expressway between Willow Run and Detroit. The cops pay no attention to your

speedometer readings on this divided highway unless you drive just plain dangerously.

This seat is exceptionally comfortable . . . and the sill behind the windshield is so low that a person getting into trouble with this car had better see his oculist. The windshield slants back until you feel as though you were sitting out in the open . . . you can see a traffic light almost directly overhead without bending forward . . . that does cut down the headroom, but it's not objectionable . . .

This car had enough miles on it to let it out. So I picked a traffic-free stretch of the Expressway and let my accelerator foot get heavy.

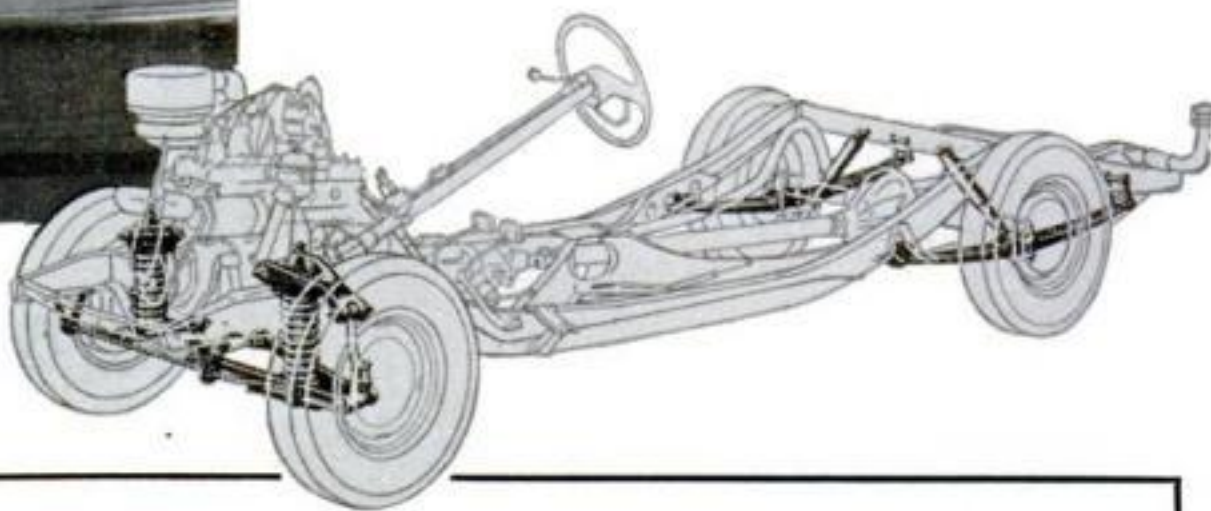
60 M.P.H. in 15 Seconds

The acceleration is good . . . I hadn't expected it to be so good with a 3.31 rear-axle ratio . . . that ratio with the automatic transmission obviously was adopted for better gas mileage . . . which amounts to 16 to 17 miles to the gallon . . .

She marches right up through 50 miles an hour . . . 60 . . . 65 . . . 70 . . . 75 . . . and 80 . . . The top speed—we'll have that in a moment—doesn't come too easily as the engine begins reaching its power peak . . . there we are—an indicated 90 miles an hour.



Jumbo-size tail lights (above) and redesigned rear springs (right) are new features on '52 Kaiser line of cars.



FACTS ON '52 KAISER

Model: Manhattan four-door sedan.

Engine: 6-cyl. L-head; 115 hp. at 3,650 r.p.m.; car weight per hp., 28 lb.; bore and stroke, 3 5/16" by 4 3/4"; compression ratio, 7.3:1; piston displacement, 226.2 cu. in.

Piston travel: (in feet per car mile at 20 m.p.h.) 1,915.

Crankshaft bearing surface: 44.6 sq. in.

Torque: 190 lb.-ft. at 1,800 r.p.m.

Transmission: Dual-Range Hydra-Matic.

Rear-axle ratio: 3.31:1; with standard transmission, 3.91; optional, 4.55.

Steering ratio: 18.2:1.

Radius of turning circle: 19'.

Effective brake-lining area: 175.7 sq. in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 3,220 lb.; height, 60"; over-all length with bumpers and guards, 212"; width, 74"; wheelbase, 118 1/2"; overhang, front 38 1/4", rear 54 1/4"; tread, front 58", rear 58 1/4".

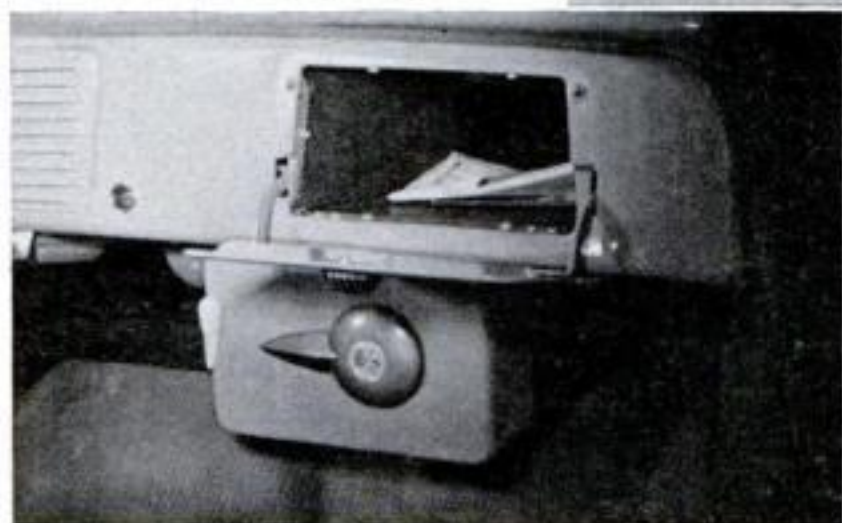
Inside dimensions: seat-cushion width, front 64", rear 63"; leg room, front 43", rear 40"; headroom, front 37 1/4", rear 36"; seat height, front 10 1/4", rear 12 1/4"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6"; front-seat adjustment, horizontal 7", vertical 5/16".

Tire size: 6.70 by 15.

New Henry Js Offer Sports and Family Versions

The Henry J's changes include new bumpers and tail lights. A 4.27-to-1 rear-axle ratio gives better fuel economy.

And now there's a glove compartment (below). Trunk lid has no handle. Unlocked, it pops up.



KAISER'S little Henry J, introduced in the fall of 1950, is getting sophisticated. For '52, it comes in two models—a Vagabond sports sedan with an outside-mounted spare wheel, and the Corsair. Other new features: shock absorbers that dampen spring action better, a starting motor that stays glued to the flywheel until the engine starts, revamped interiors.

I slacked off and let the car coast to a stop. I wanted to put a timer on the acceleration. The speedometer had calibrated to an error of three miles, registering 60 at an actual speed of 57. That's about normal for car speedometers these days—in the higher speed registers the manufacturers keep widening the gap between indicated and actual speeds. It represents an effort to reduce deaths on the highway.

First, I stop-watched the Kaiser from a standing start to an indicated 60 miles an hour by starting in Low range and shifting to Drive at 30 miles an hour. The first try took 15.9 seconds. A second try took 15.1. Then I timed the acceleration using Drive range from the start.

I've got one passenger aboard and a full gas tank . . . and unless I'm mistaken . . . I'll beat the acceleration time I got when I shifted. Here we go . . . the take-off is fast . . . it always is with these Hydra-Matics . . . 30 miles an hour . . . 40 . . . 50 . . .

Again . . . there's 40 . . . 50 . . . 60, in . . . let's see here . . . 14.5 seconds. That's only about one second slower than the fastest big-production Hydra-Matic car I've ever driven . . . and it had more horsepower. This L-head engine's got what it takes.

Now I tried the braking power. The Kaiser stopped dead with hard braking from an indicated 60 (which was 57 miles an

hour) in an even 117 feet. That's 68 feet better than the figure given by the National Safety Council for stopping from 60.

It *was* hard braking. The car dived severely. It also weaved. The left rear brake grabbed. The brakes needed adjustment.

Nothing Else Like It

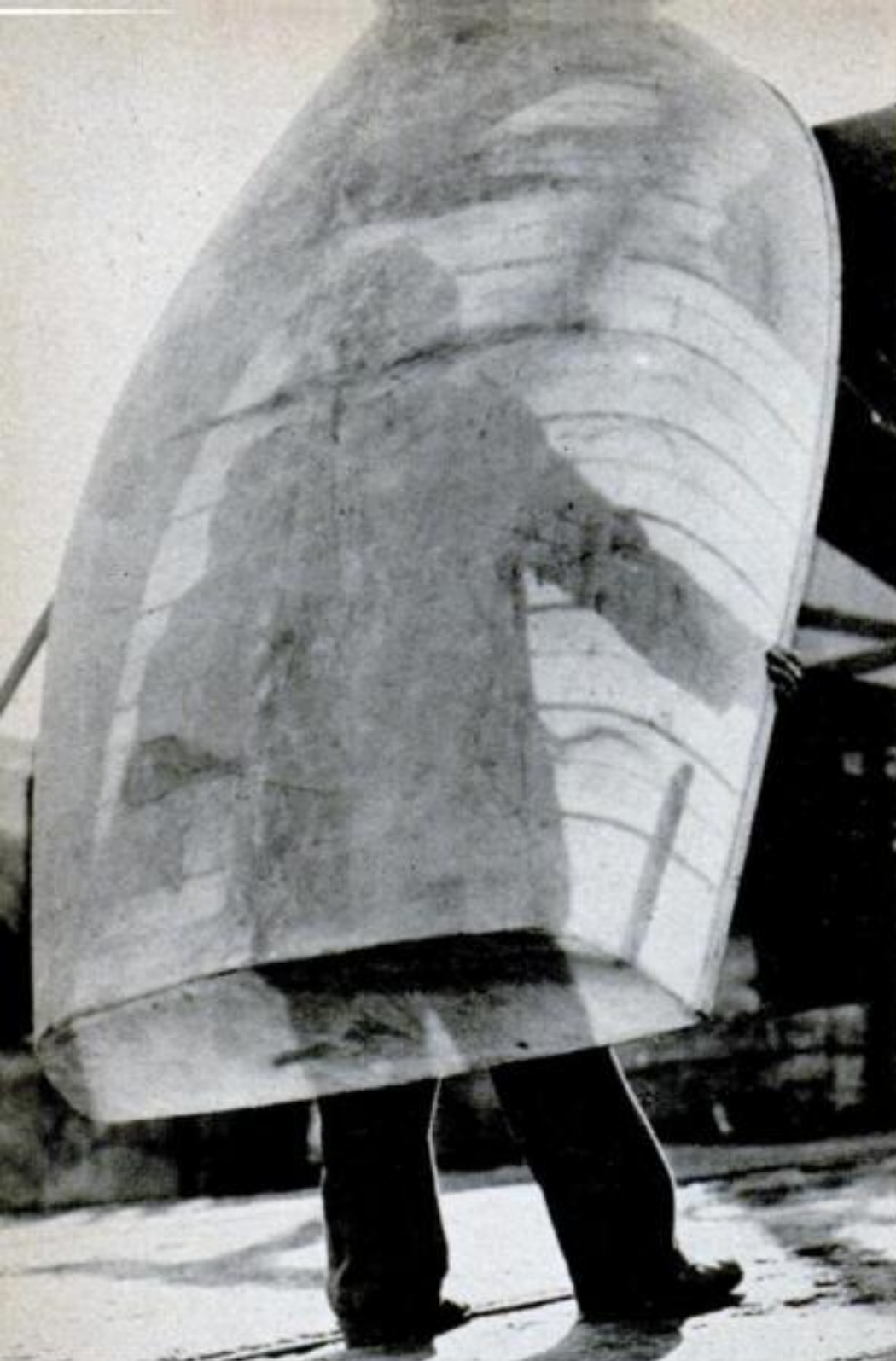
I made my final comments on the Kaiser as I steered back toward the factory abutting the vast Willow Run airport.

I can find little faults . . . this rear-vision mirror is too low, for instance . . . it cuts off part of my view of the road . . .

But Henry Kaiser has a good car here . . . make no mistake about that . . . these safety features in the front seat . . . he deserves a pat on the back for them. The windshield that pops outward if it breaks . . . control knobs recessed in the dash so you can't get caught on them . . . padding on the dash . . . all help protect anybody riding that danger spot beside the driver . . . And in styling he could teach a thing or two to other manufacturers . . . its lines are as graceful as a woman's. There's really nothing like it in the industry.

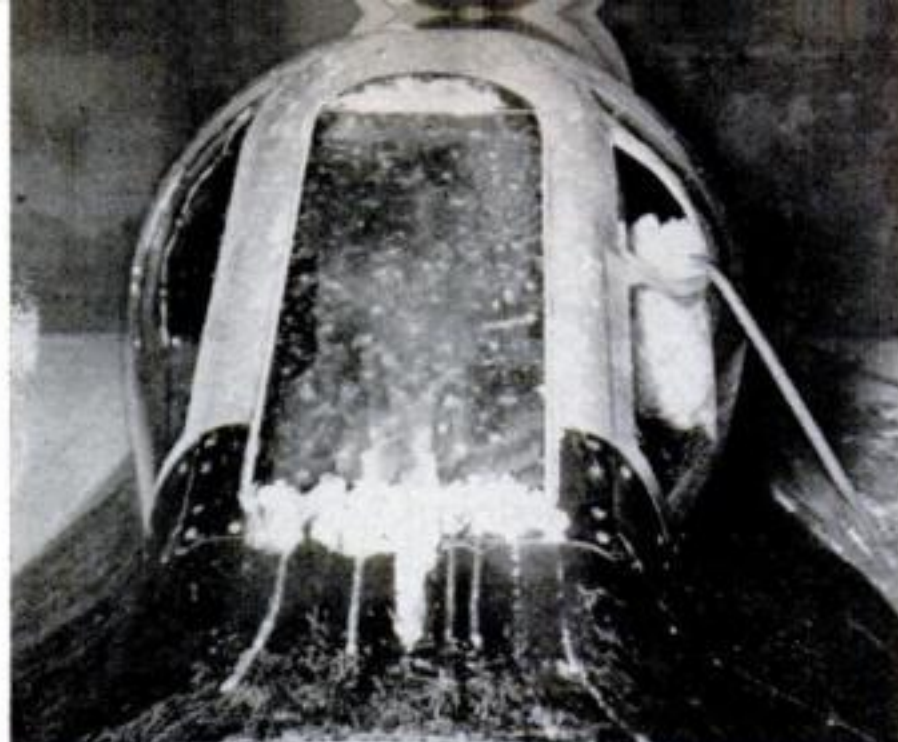
As if in corroboration, my eye fell on a two-tone green job in the company garage as I parked. Anyone who wouldn't give it a double-take probably wouldn't look at a pretty girl either.

END



Boat You Can See Through

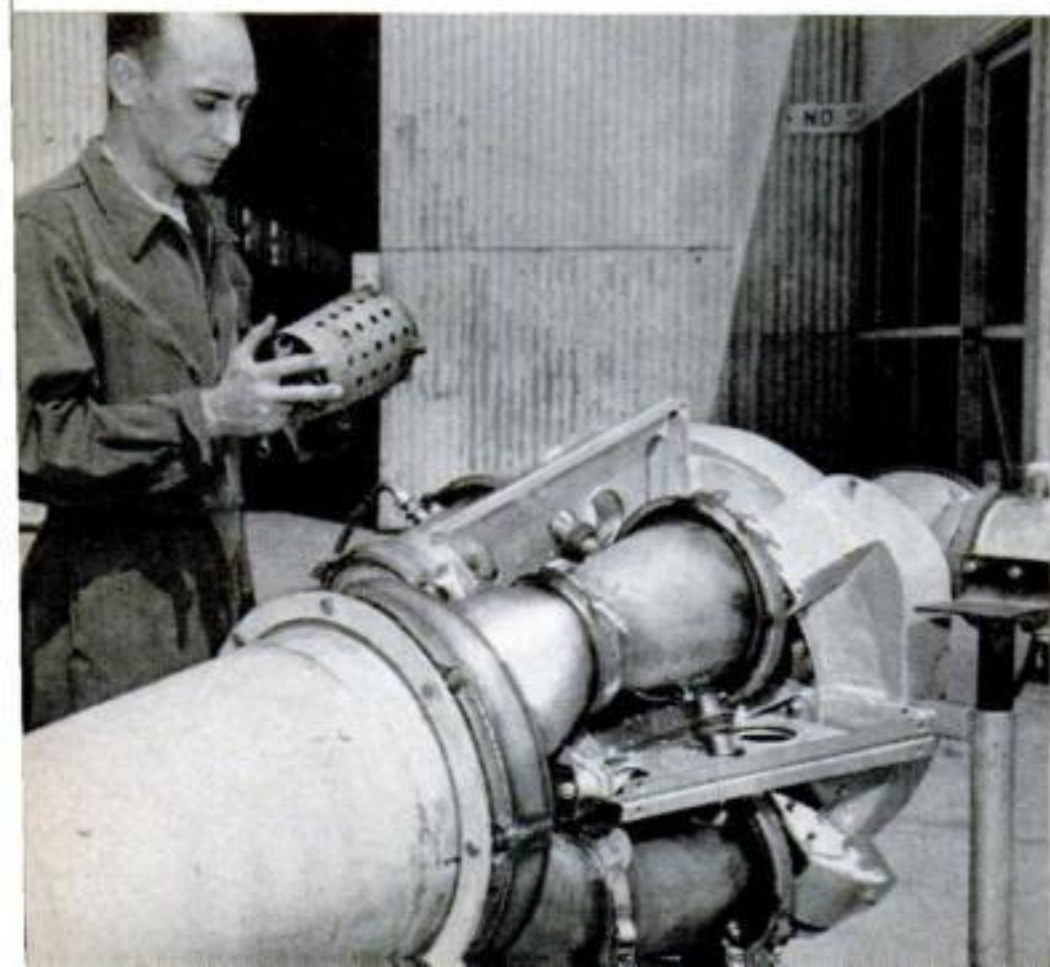
THIS lightweight, glass-hulled dinghy is less than an eighth of an inch thick but is said to be extremely tough. Molded of resin-bonded glass fiber at the Medina Yard on the Isle of Wight, in England, the translucent boat requires no attention apart from cleaning. It cannot rot or decay and is safe from attack by insect borers.



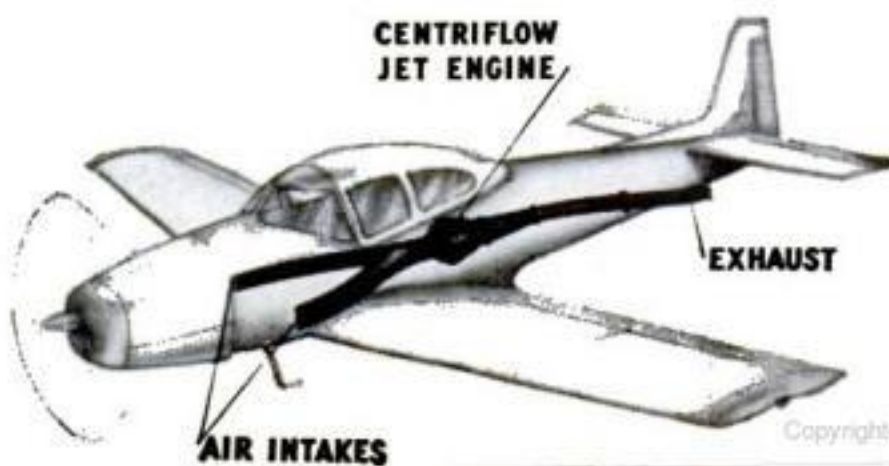
Jet Pilots Get Quickie Deicer

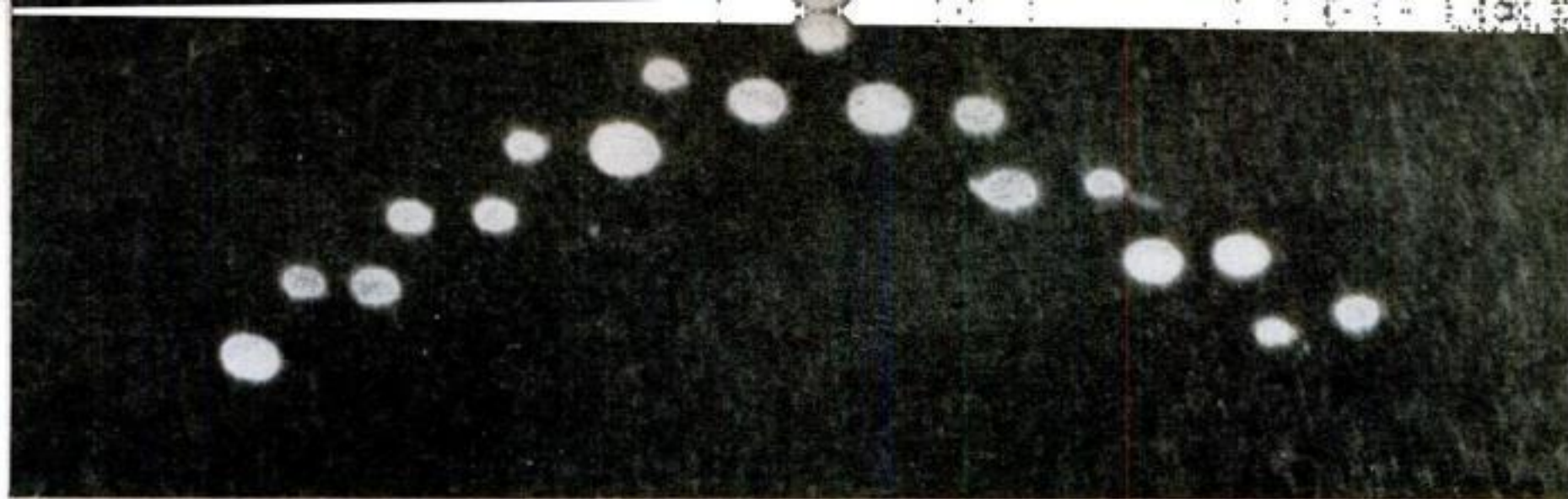
WINDSHIELD icing holds no terrors for F-89 pilots. An electrical-resistance coating on the outside of the windshield heats when the deicer is turned on. Lower picture above was taken only a few minutes after upper one was snapped. The cold-weather test was made to check the Scorpion's ability to operate in the Arctic.

Baby Jet Engine May Speed Small Planes at 300 Miles an Hour



PRIVATE fliers, too, may soon become jet jockeys. A baby jet engine (left) weighing only 172 pounds has been designed by students at the Northrop Aeronautical Institute, Hawthorne, Calif. It develops 340 pounds of thrust, has twin air intakes and a single exhaust. The student shown is holding one of four burners. First installation is planned for a Ryan Navion.





THE LUBBOCK LIGHTS, shown here in one of five photographs taken in 1951 by Carl Hart, 18, of Lubbock, Tex., mystify our foremost

scientists. In 1886, a young man in Wales reported a similar, smaller group of what he called meteors that traveled together.

Flying Saucers Are Old Stuff



Robert L. Unger

They've been sighted and reported in pretty much the same terms for centuries, says writer who has found 300 ancient accounts.

IN 1872, long before there were any airplanes or plastic weather balloons, the Royal Meteorological Society of Britain received a strange report from the captain of the sailing ship *Lady of the Lake*.

While homeward bound for England from tropic ports, the vessel's crewmen had called Capt. Frederick William Banner's attention to an amazing sight in the sunset-stained sky.

Captain Banner later described it in his log as "a most curious-shaped cloud." It was circular, light gray, and luminous. It looked, he wrote, "like the sun or moon with a halo around it." Furthermore, it was behaving most unlike a cloud. It was moving against the wind, rising from a point in the southeast where no other clouds were at the time until it was nearly overhead. There it briefly hovered, and the astonished sailors saw that it had strange markings and a dis-

tinct tail, like a comet's. Captain Banner noted that "patches of cirro-cumulus seemed to squirt from the back." Then the frightening object headed downward toward the horizon, still against the wind, and disappeared into the northeast as darkness shut in.

Captain Banner sent a copy of his log to the Royal Meteorological Society. At the society's next meeting, January 15, 1873, the report was read, discussed, and dismissed as unexplainable.

Similar sights still baffle scientists. Many of the flying saucers seen in recent years have turned out to be weather balloons. But, an Air Force spokesman admitted this spring, "a number of reported sightings cannot be thus explained, and as long as this is true, the Air Force will continue to study the problem."

While pondering this problem, Robert

L. Unger, who is now a technical writer for the Republic Aviation Corp., of Farmingdale, L. I., began to wonder how long such strange things had been appearing in our sky. Unger flew B-25s in the Pacific theater of operations during the war, and later did graduate work at Yale. While there, he began prowling through the long history of "saucer stories."

He reports now that he has found evidence that men have been seeing things which resemble saucers for at least 355 years. He has collected, he says, 300 such reports as the one from Captain Banner that mystified the Royal Meteorological Society 80 years ago.

Mystic's Work Started It

The books of a man named Charles Fort, half scientific writer, half mystic, who died in 1932, inspired Unger to continue this fascinating research. Fort had paged through hundreds of scientific journals, some of them dating from the sixteenth century, and extracted accounts of strange happenings in the sky that science had never been able satisfactorily to explain.

Unger, beginning in 1948, followed in Fort's path, eagerly picking out the reports that sounded like current newspaper accounts of flying-saucer sightings. He carefully tracked down every source, and found at least half again as many new ones. The 300 accounts he has gathered date from 1907 back to the late eighteenth century.

Of all the baffling reports that the Air Force has received since 1947, when "flying saucer" entered the language, some of the hardest to explain have been those concerning the Lubbock Lights. That is the name that has been given to mysterious groups of luminous spots which several responsible citizens of Lubbock, Tex., repeatedly saw travel noiselessly across the night sky in 1951 at tremendous speed and in distinct flying formation, usually V-shaped.

Seen by Navy in 1904

When Unger read the first reports from Lubbock, he immediately remembered an experience reported to the *U. S. Monthly Weather Review* in 1904 by Lieut. F. H. Schofield, aboard a Navy supply vessel at sea.

Shortly after six o'clock on the morning of February 28, the lieutenant and two members of his crew were staggered to see

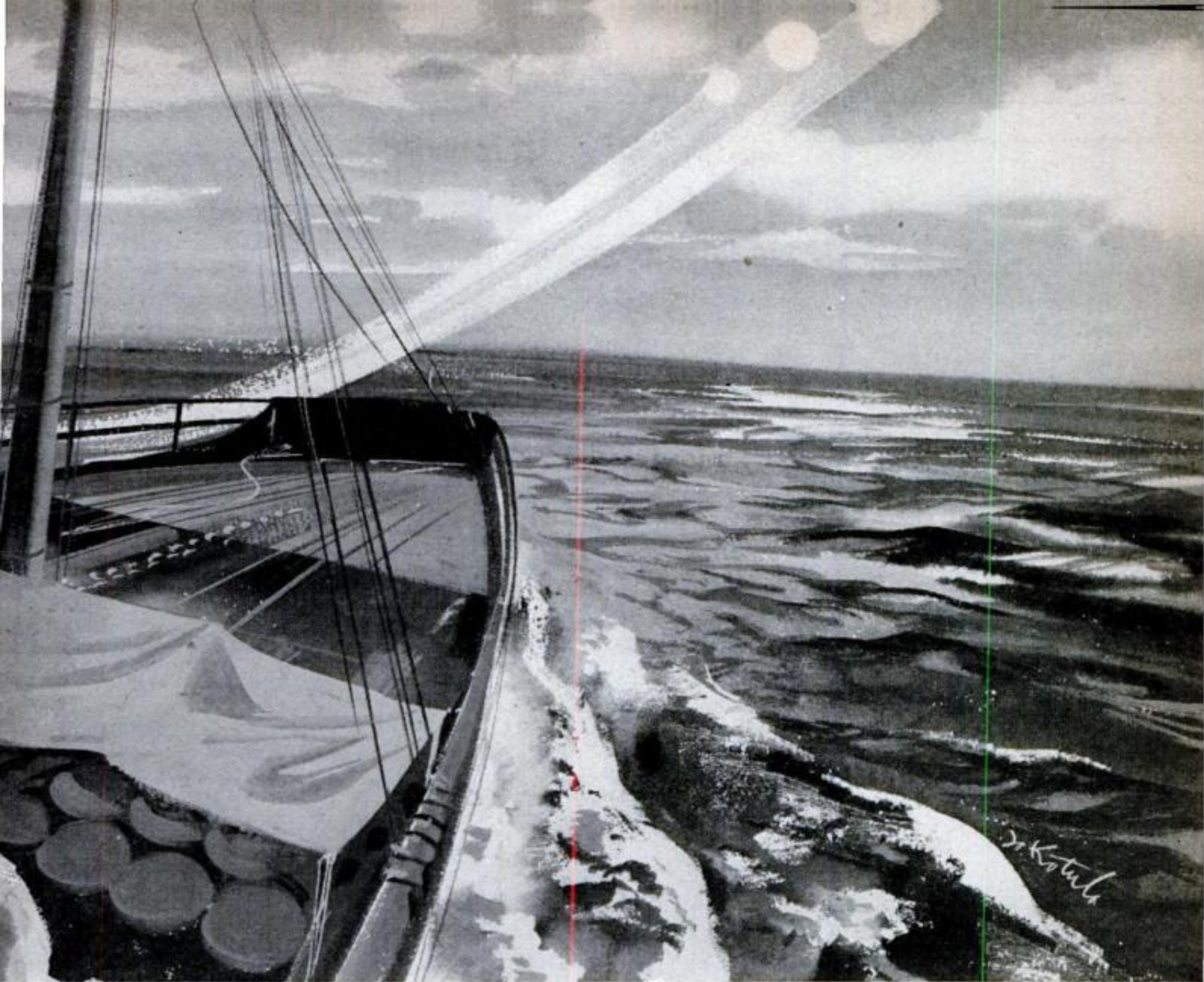


"METEORS" FLYING IN FORMATION and behaving most eccentrically were seen at sea in

what appeared to be three meteors hurtling towards the ship in a tight little group from the northwest.

"At first," Schofield reported, "their angular downward motion was very rapid and their color a rather bright, glowing red. But as they approached the ship they suddenly soared upward at an angle of 45 degrees and passed through the clouds. After rising above the clouds their angular motion became less and less until it ceased, when they appeared to be moving directly away from the earth at an elevation of 75 degrees and in a west-northwest direction."

The largest meteor, which Schofield said looked as large as six suns, was egg-shaped and led the formation. The two others were perfectly round, one appearing to be the size of two suns, the other the size of the sun itself. When they shot away from the ship in the direction from which they had



1904. Unger has found that nineteenth- and twentieth-century reports of "saucers" all

fall into three categories; disks, cigar-shaped objects and fast-moving, inexplicable lights.

come, "there was no change in their relative positions."

When the newspapers, beginning in 1948, told of terrifyingly bright green fireballs that hundreds of people in the Southwest had seen flash across the bare hills in straight, silent, horizontal flight, Unger recalled a strikingly similar account that he had come across in an old issue of a magazine called *The Observatory*. The writer, a professional British astronomer, said the most remarkable experience he had ever had took place one clear evening in the autumn of 1882.

"A Disk of Greenish Light"

"A great circular disk of greenish light suddenly appeared low down in the east-northeast, as though it had just risen, and moved across the sky, as smoothly and steadily as the sun, moon, stars, and planets move, but nearly a thousand times as quick-

ly," he wrote. As it moved, in "a steady, uniform progress from east to west," it lengthened out. "When it crossed the meridian and passed just above the moon, its form was that almost of a very elongated ellipse, and various observers spoke of it as 'cigar-shaped,' 'like a torpedo,' or a spindle or shuttle."

Like the distinguished German rocket designer, Dr. Walther Riedel, and Dr. Maurice A. Biot, a top U. S. aerodynamicist, Unger is convinced that flying saucers, "cigars," and unexplainable lights in the sky at night are all evidence of visitations from some other world. The objects may not be manned; they may be radio-controlled, pilotless craft rigged up with some other world's notion of television to record what we are up to. Judging by the similarity of the reports since 1597, they may have been watching us a good, long time. **END**



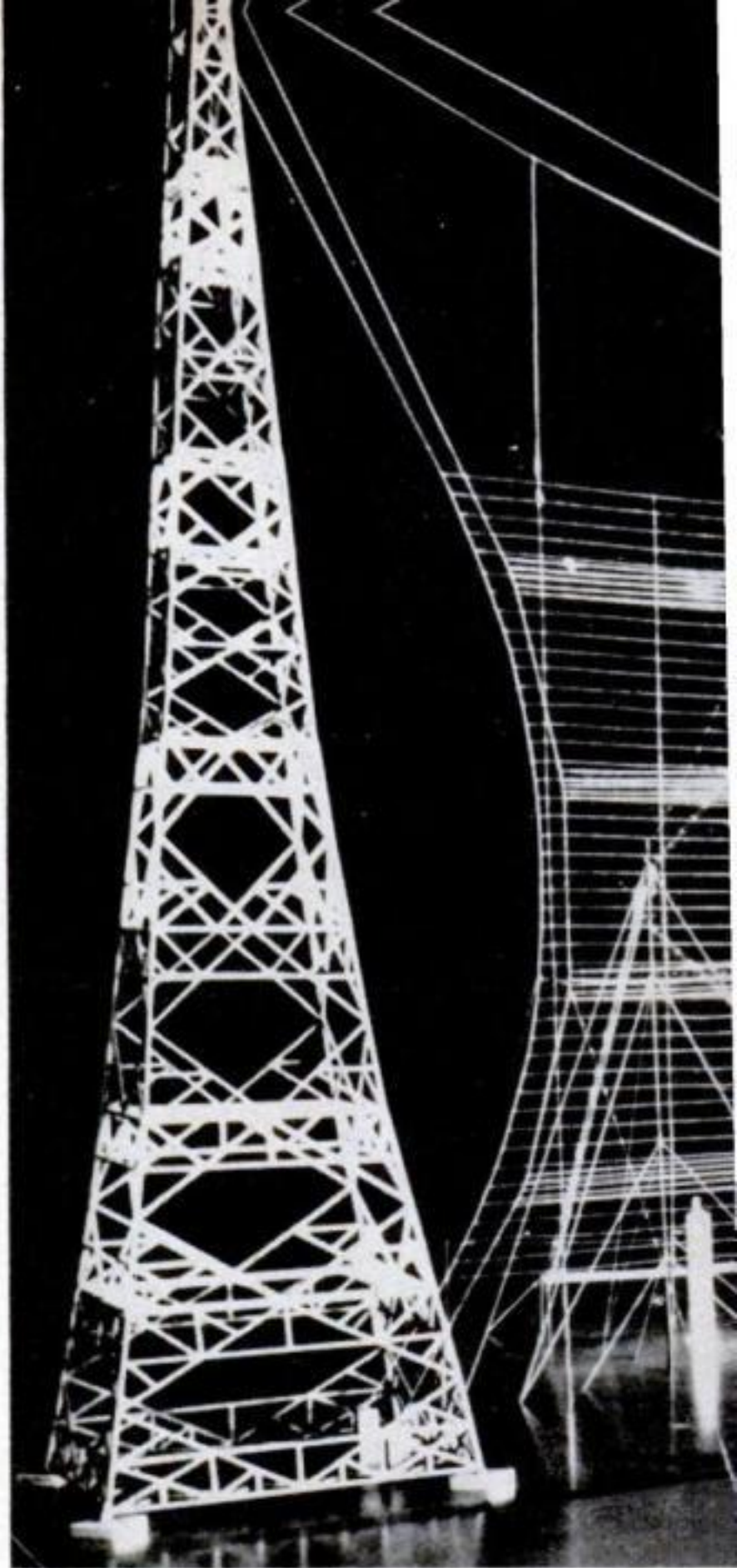
"A NEW KIND OF WEAPON for a new kind of beach-head," the *Courier*, loaded with radio transmitters and secret electronic equipment, has sailed off to help work out ways to overcome Russian jamming.

By Wesley S. Griswold

NOT long ago the U. S. launched a new kind of battleship—a Coast Guard cutter armed with the most powerful radio transmitters that ever went to sea. The 5,800-ton, 338-foot *Courier* sailed off to a secret destination, but there was no secrecy about its mission. It is the country's latest weapon in the cold war of the air waves between the leading democracies and the Communist nations.

Flying its main antenna from a captive barrage balloon filled with helium, the *Courier* will anchor in friendly foreign ports as close to Russia as possible. From there its 150,000-watt medium-wave transmitter and two 35,000-watt short-wave transmitters will lob explosive messages of truth over the Iron Curtain.

Congress has been asked to provide the money for two more ships like the *Courier* but with greatly increased transmitting power. Meanwhile, the U. S. fires most of



CURTAIN ANTENNAS two city blocks long, with towers 289 and 249 feet

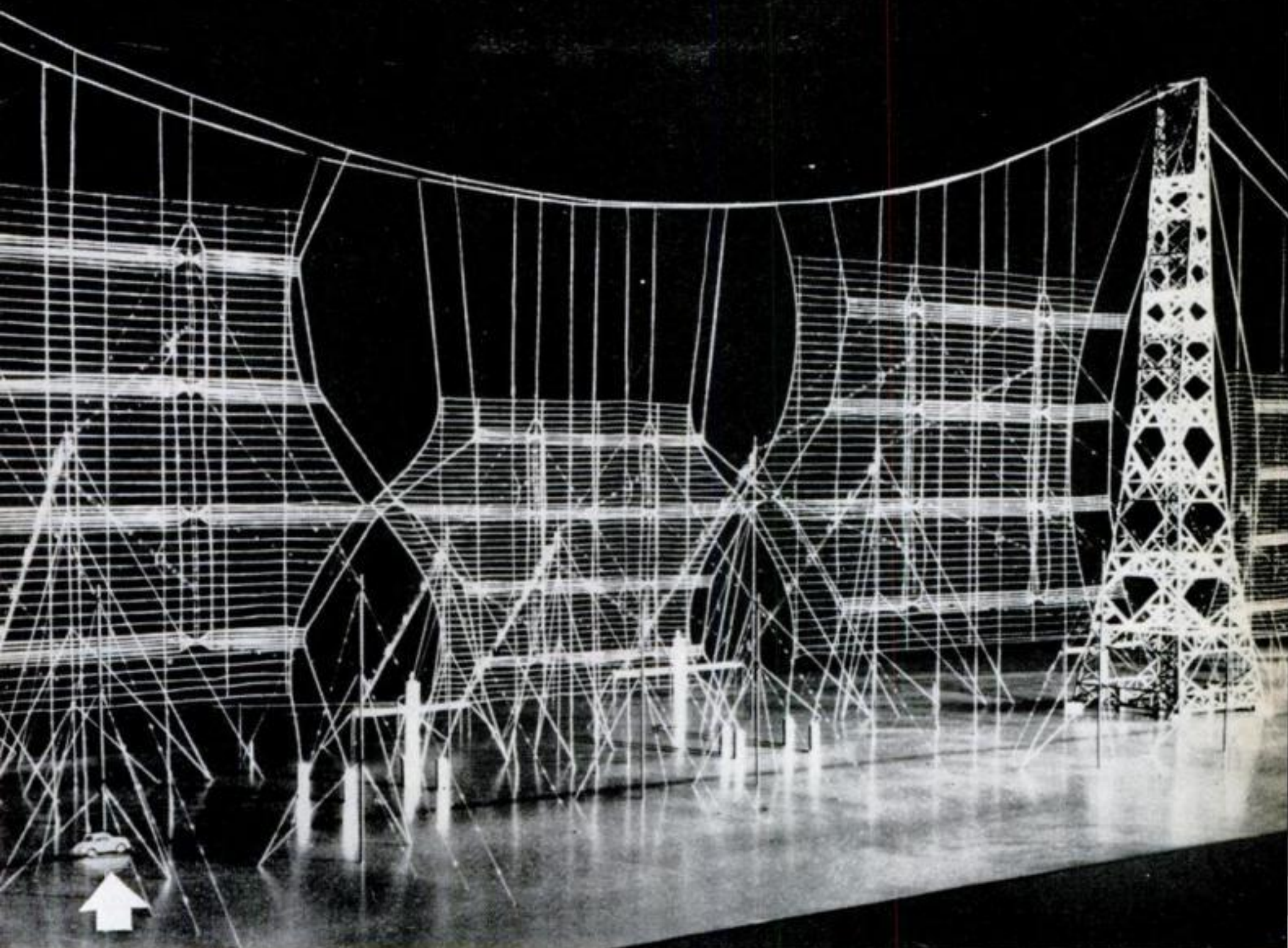
its radio guns from home soil—44 transmitters, ranging in power from 50,000 to 200,000 watts, located in Massachusetts, New York, New Jersey, Ohio and California. Others are being forged, to be set up in North Carolina and the State of Washington.

Air War Rages Over Europe

The answering fire from the Reds that reaches the 96,000,000 receiving sets of North America is weak and spotty. The main battleground is in Europe, with secondary engagements being fought in Asia. Skirmishes occur from time to time in Africa. An occasional shot lands in South America and even in Australia.

In Europe, barrages and counter-barrages

Every minute of the day, a world-wide battle rages for men's attention. Here is the behind-the-microphones story.



high, will soon give the U. S. the loudest radio voice in the world. Ten such antennas

are in use or being built. This model, with a toy car in scale, shows how they will look.

are continuous and fierce. There the principal British and Russian battle lines are drawn, and the U. S. has moved up 29 transmitters to forward positions. Five of them are placed on the territory of our ally, Great Britain. Thirteen are located in Germany, one in Greece, four in Portugal and six in Tangier, just across the Strait of Gibraltar from Spain. More are being built.

For popping propaganda shells into Asia, the U. S. has set up two transmitters in Hawaii, four in the Philippines and one in Ceylon.

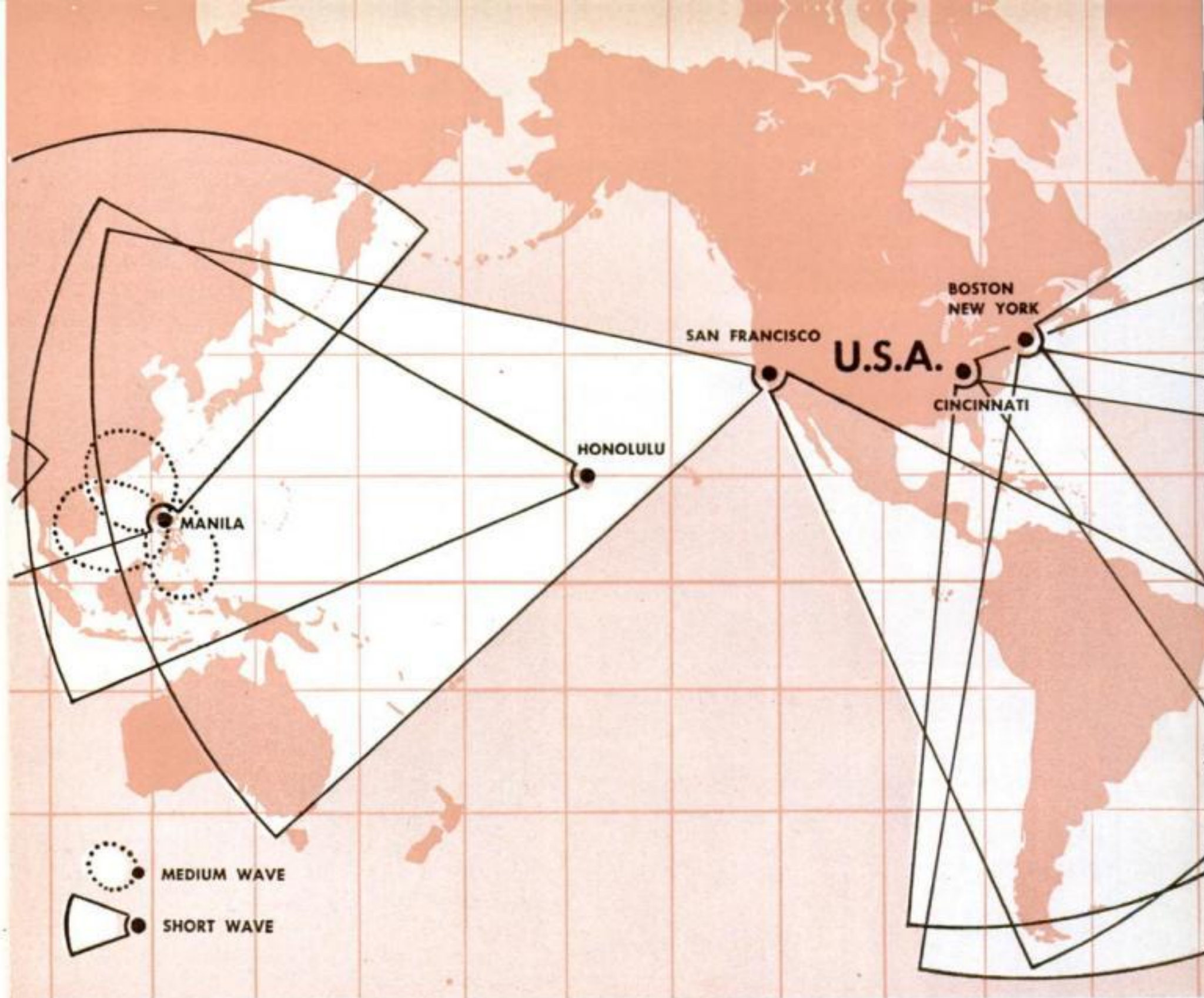
As ammunition, the Voice of America, which is the official and biggest U. S. battle unit in the war of the air waves, chiefly uses straight news and dependable intelligence reports of what is going on in Com-

munist countries. It riddles the latest Red distortions of facts by telling the truth. It also tells the world what life here is like, and presents talks by leading citizens to explain what most Americans believe in. It seasons the whole mixture with the favorite music of many nations.

Refugees Supply Ammunition

Radio Free Europe, next in importance on the U. S. side, has the advantage of being unofficial and therefore able to fight rougher. It is a small and highly damaging body of American commandos, supported entirely by private contributions, who concentrate on Poland, Czechoslovakia, Hungary, Bulgaria, Romania and Albania.

Since RFE began broadcasting on July



PLAN OF CAMPAIGN is to reach 340,000,000 pairs of ears, the estimated number of radio

listeners outside North America. Map shows areas that Voice of America bombards with

4, 1950, it has made the fullest possible use of anti-Communist refugees from the six Soviet satellite states of eastern Europe. Escaped Hungarians talk to the Hungarians back home, Poles to Poles, Czechs to Czechs. These people put the finger on Red agents and collaborators, reveal conditions that the regimes are anxious to hide from their own people as well as from the world, and do everything short of inciting armed revolt to weaken the power of the puppet governments that Russia installed.

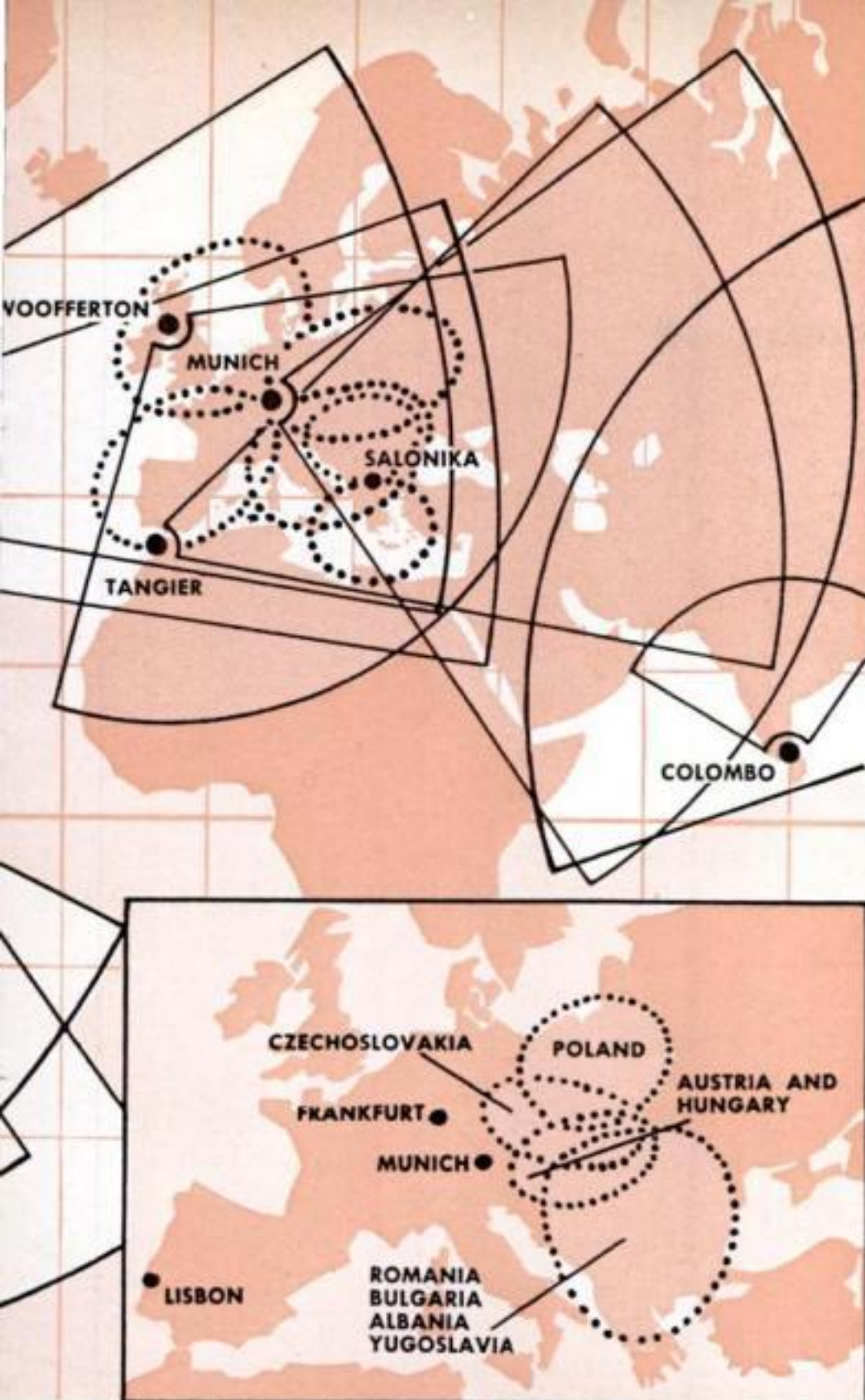
It is hard to tell which side is ahead in the cold war of the air because the victories almost never win headlines. There have been a few striking exceptions. When two Russian military pilots flew out of the Soviet Union to freedom in the West, they said persuasive American and British broadcasts had convinced them that they should try to escape. The Czechs who drove a train and its passengers across the frontier

between their captive country and West Germany said the same thing. So did the Polish crew who sailed a mine sweeper to a safe haven in Sweden, and the Czech boys, forced laborers of the Soviets, who dug their way out of a uranium mine in East Germany and escaped.

Underground Stations Join Fight

The first evidence Radio Free Europe had that it was landing effective shots in Communist territory came when the Russians began broadcasting threats to hang every German they could get their hands on who had assisted Radio Free Europe in any way.

Anti-Communist radio stations have been overheard rebroadcasting RFE information inside Albania, Czechoslovakia, Hungary and Bulgaria. A mobile, unlicensed transmitter calling itself Radio Free Russia, and concentrating on Soviet troops in East Ger-



its 75 transmitters. Inset above shows areas that Radio Free Europe peppers with its nine.

many and Austria, started operating somewhere in western Germany a year ago.

Voice of America and Radio Free Europe campaign commanders obtain their best reports on battle progress from letters. VOA mail has reached a volume of 40,000 letters a month, from both sides of the Iron Curtain. A Russian who recently escaped to West Germany wrote VOA: "Your broadcasts undermine the Soviet regime and . . . are a weapon more powerful than the atom bomb."

After Radio Free Europe had accused 16 officials of the Ganz Electrical Works in Budapest of being informers, it promptly received a letter from one of the workers in the plant telling what happened:

"The factory went wild. Commies were running in and out. Secret conferences were held at all hours. And everyone was under suspicion. Morale sagged. Work practically stopped everywhere. It was a darned fine

job! It should be repeated—and often."

Another letter described how the inmates of a camp for political prisoners in Czechoslovakia had managed to hide a short-wave transmitter in the camp dentist's chair and broadcast accounts of what was going on in the camp to Radio Free Europe. When RFE later repeated the accounts in broadcasts to Czechoslovakia, Communist police tore the camp apart until they had tracked down and destroyed the telltale transmitter.

Enemy's Tricks Are Exposed

A Hungarian wrote of an extraordinary effort that the Communist regime there had made to discredit Radio Free Europe. RFE broadcasts had been telling how Red big shots were wasting the people's money in riotous, costly evenings at a Budapest club. One night, trucks and men suddenly descended on the club and completely removed it. The next day, the Communist radio jeered at RFE and invited Hungarians to see for themselves that no such club existed. The people of the neighborhood, however, told the true story, with great satisfaction, to everyone who asked.

An old man in Budapest wrote Radio Free Europe that of the 60 families in the apartment house where he lived at least 10 listened regularly, without fear, to RFE broadcasts. He could hear the broadcasts himself clearly on his four-tube set, he said.

With the aid of informants such as these, Radio Free Europe has been able to warn the people of Bulgaria that government men coming around to collect waste were frequently members of the secret police. It has been able to warn the Czechs of the Communist practice of erecting false frontier posts near the real ones and manning them with Red police in stolen American and German uniforms to trap citizens trying to escape to West Germany.

Reds Broadcast Wolf Calls

The Communists have reacted on the air with screams of rage, calling the Americans and British liars, cheats, wicked imperialists and bloody murderers at all hours of the day. They distort the news to make it appear favorable to their cause, and when this cannot be done convincingly, they omit it altogether.

Most of all, they try to prevent the Western voices from getting a word in edgewise. Mobilizing a formidable battery of 1,250 transmitters, the Russians endeavor to



THIS IS THE IRON CURTAIN. Propaganda signs in Red Czechoslovakia face West Germans.

Biggest sign reads "The world's workers well know the imperialists' crimes in Korea."

drown them out by continuously broadcasting Siberian wolf calls, the screaming of sea gulls, the roar of airplane engines and the hum of electric motors.

To overcome this jamming, British and American radio engineers rely, first, on the power, number and position of their transmitters. Whenever the budget allows, they gain signal strength by stepping up transmitting power and improving antennas. Occasionally they combine forces, using more than 70 transmitters simultaneously to land signals of tremendous strength on predetermined spots in the target area.

Russians Jam Own Broadcasts

One of the most effective counter-jamming techniques is called "cuddling." It is the process of beaming signals at Russia and her satellites on frequencies so close to the ones they use for domestic broadcasts that the jammers cannot smother the incoming signals without wiping out their own.

This is especially disruptive in Russia, for wire-transmission facilities are so inadequate that the national radio network is of far greater importance than it is in the leading Western countries. Newspapers in remote parts of Russia depend on the radio for their news and the latest official propaganda line from Moscow. Because of this, a really intensive jamming effort by Soviet radio engineers can bring about a news blackout in their own country.

Another way in which British and Amer-

ican technicians outwit the jammers is by bouncing signals off the ionosphere at a variety of angles so that they land in a checkerboard pattern. The highly directional signals arrive on their downward journey from the ionosphere with maximum intensity. There is no way in which the jammers can tell where or when such a signal will land, and in order to drown it out they must land a signal of equal or greater strength right on top of it. This is hard enough to do when the incoming signals are all landing in one area. When they are arriving in a checkerboard pattern, the problem becomes enormous. There are almost certain to be corners in each square where signals escape the jammers.

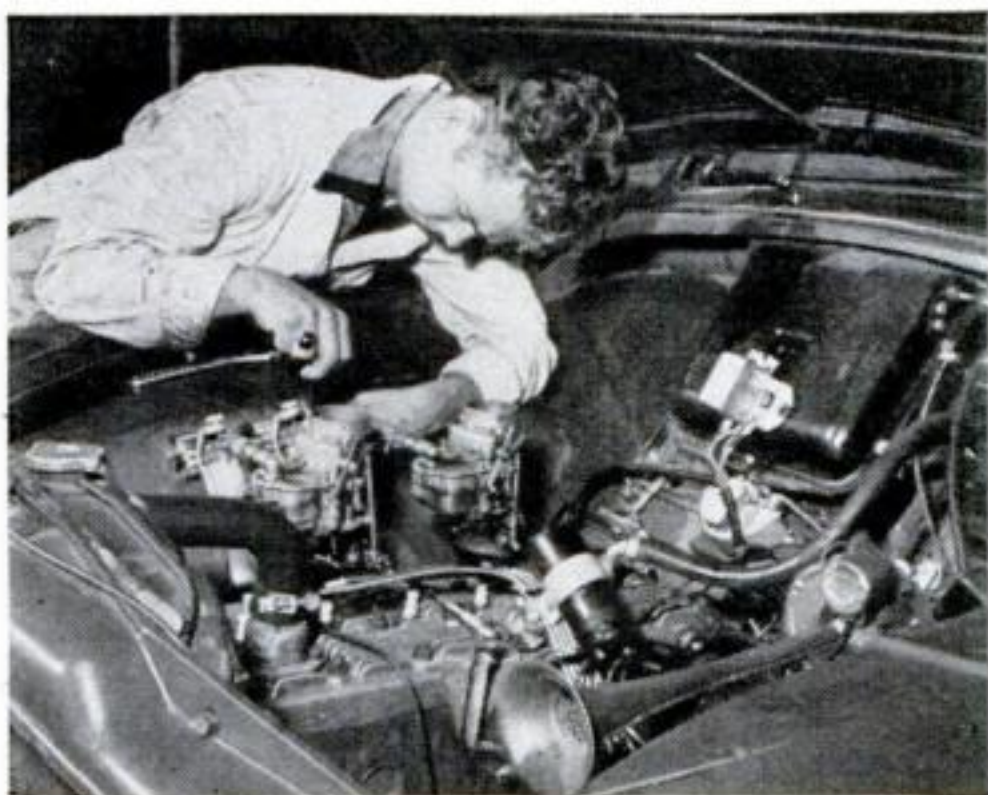
As a third device for penetrating the jamming defense, the Voice of America sends news to Russia in Morse code eight hours a day, at a rate slow enough to suit even a poor telegrapher. Code is far harder to jam than voice signals. It can be transmitted over a much wider range of frequencies. It is an interrupted signal and therefore harder to locate. Finally, while a weaker jamming signal can garble voice transmissions effectively, it does not obscure code. An experienced wireless operator can "read" the message right through the interference.

The Russians are impressively expert at jamming, but with all their transmitters they cannot lay a thick blanket of noise over the immense distances of their land. There are bound to be holes in the blanket.

[Continued on page 248]

This Is Better Than Whistling

WITH eye-catching results, 16-year-old Henry Koopman Jr., of Whittier, Calif., made over a 1950 Nash Rambler convertible. Aided by his brother Art, 21, he lowered the body, replaced the soft top with a removable one of steel and boosted engine power. A resplendent metallic red paint job and red-and-white leather upholstery prove irresistible to home-town girls looking for a lift, an effect not unanticipated by Henry. Electric push buttons open doors.



TWIN FORD 6 CARBURETORS are adjusted (above) by elder brother Art. Below, brother Henry takes wheel of the come-hither-styled convertible, with electric push buttons ready to open doors fast.



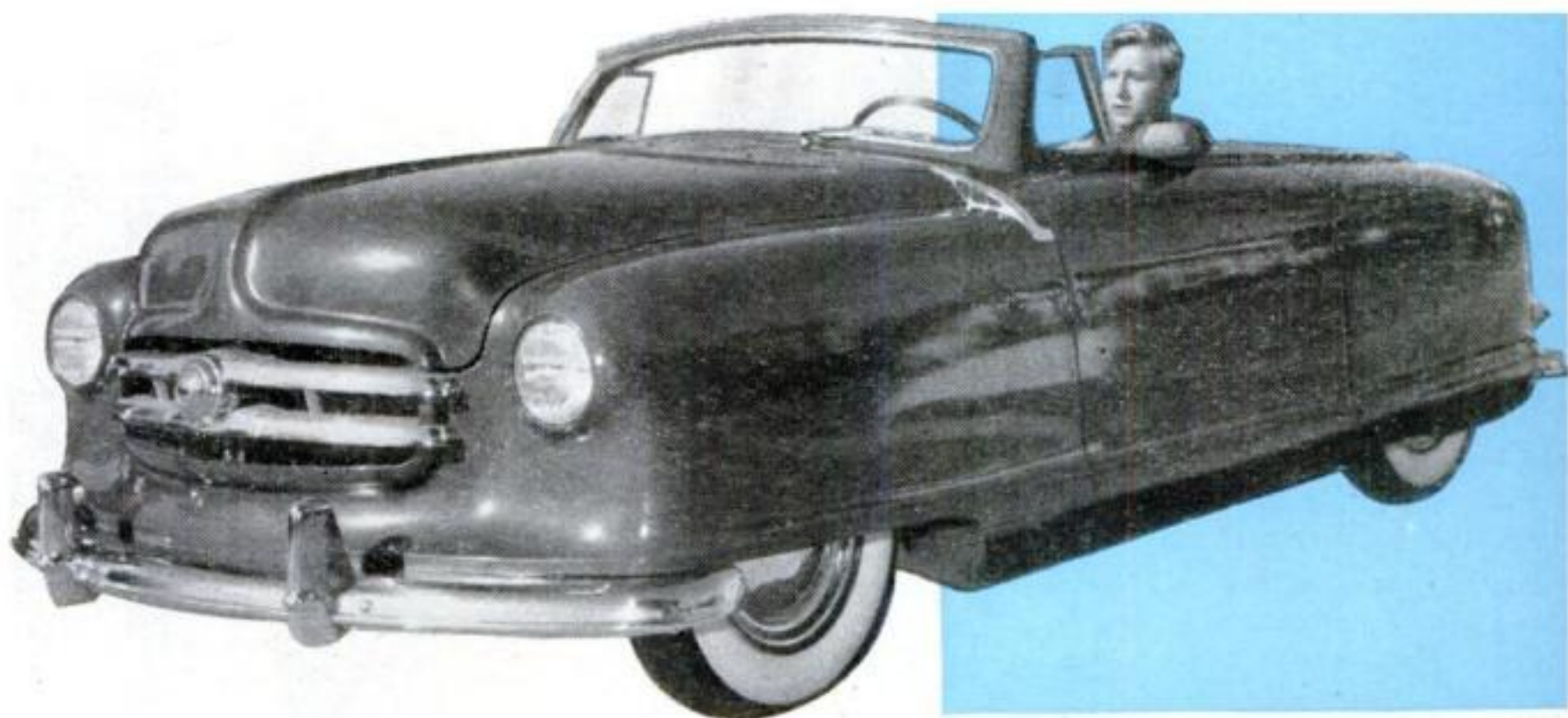
IN THREE MINUTES, hard top can be removed from remodeled Rambler. After unsnapping fasteners, the brothers lift off 200-pound top as above.



LOWERING BODY seven inches has enhanced trimness of car lines. Headlamps are faired into body. Parking lamps and chrome molding are gone.



STEEL TOP is attached by two clips at front and rod at rear. Interior has red-and-white leather upholstery to go with metallic red paint job.



Side-Mounted Drill Press Makes Holes at All Angles

THE familiar drill press has been redesigned to do a better job in industry. Instead of straddling the column, the drill head clamps alongside it. This change allows angular swing of the head and adjustment of throat capacity—distance between drill and vertical column. It also minimizes the minute bending sometimes found under heavy loads in conventional drill presses.

Self-contained, automatic power-feed mechanisms are quickly attached to the heads. A steel-backed rubber "gear belt," fitted with lugs that mesh in recesses in special pulleys, delivers power from motor to spindle. Because it doesn't have the usual large four-step pulley, the spindle housing is narrower and the heads can be put closer together for multiple-drilling setups. The Magna Engineering Corp., Menlo Park, Calif., makes the tool.

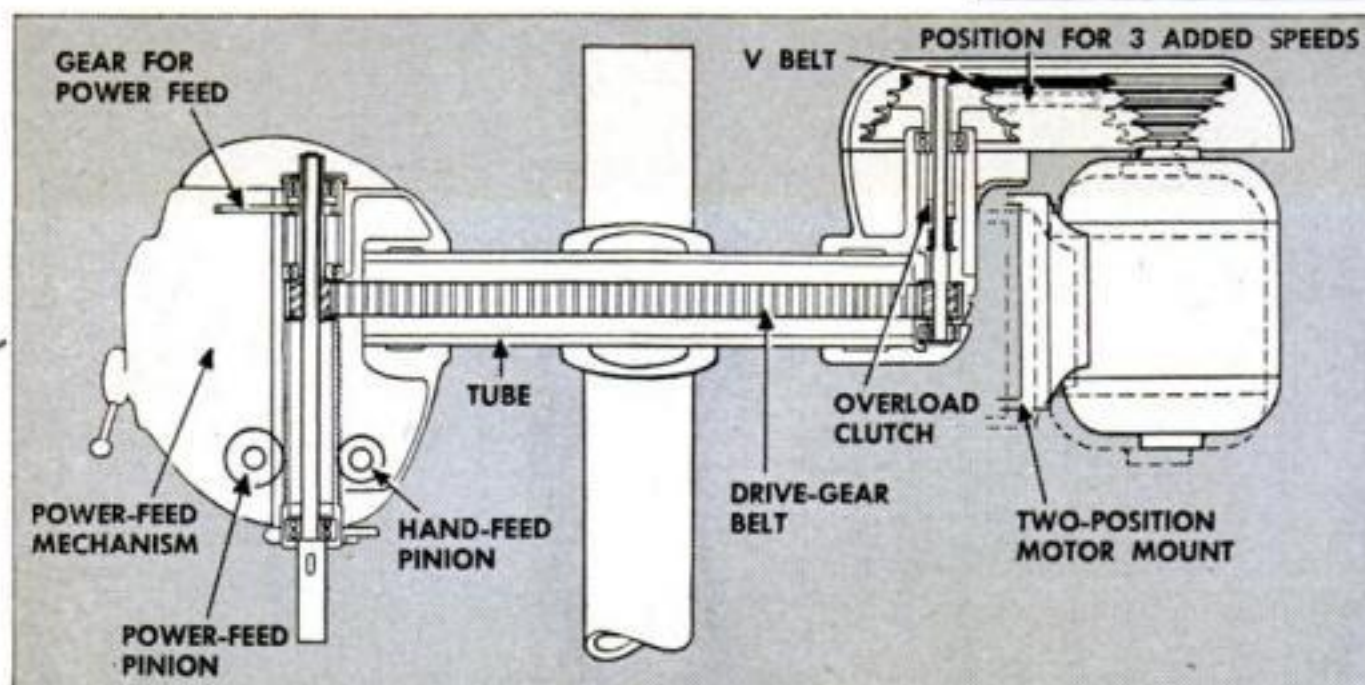
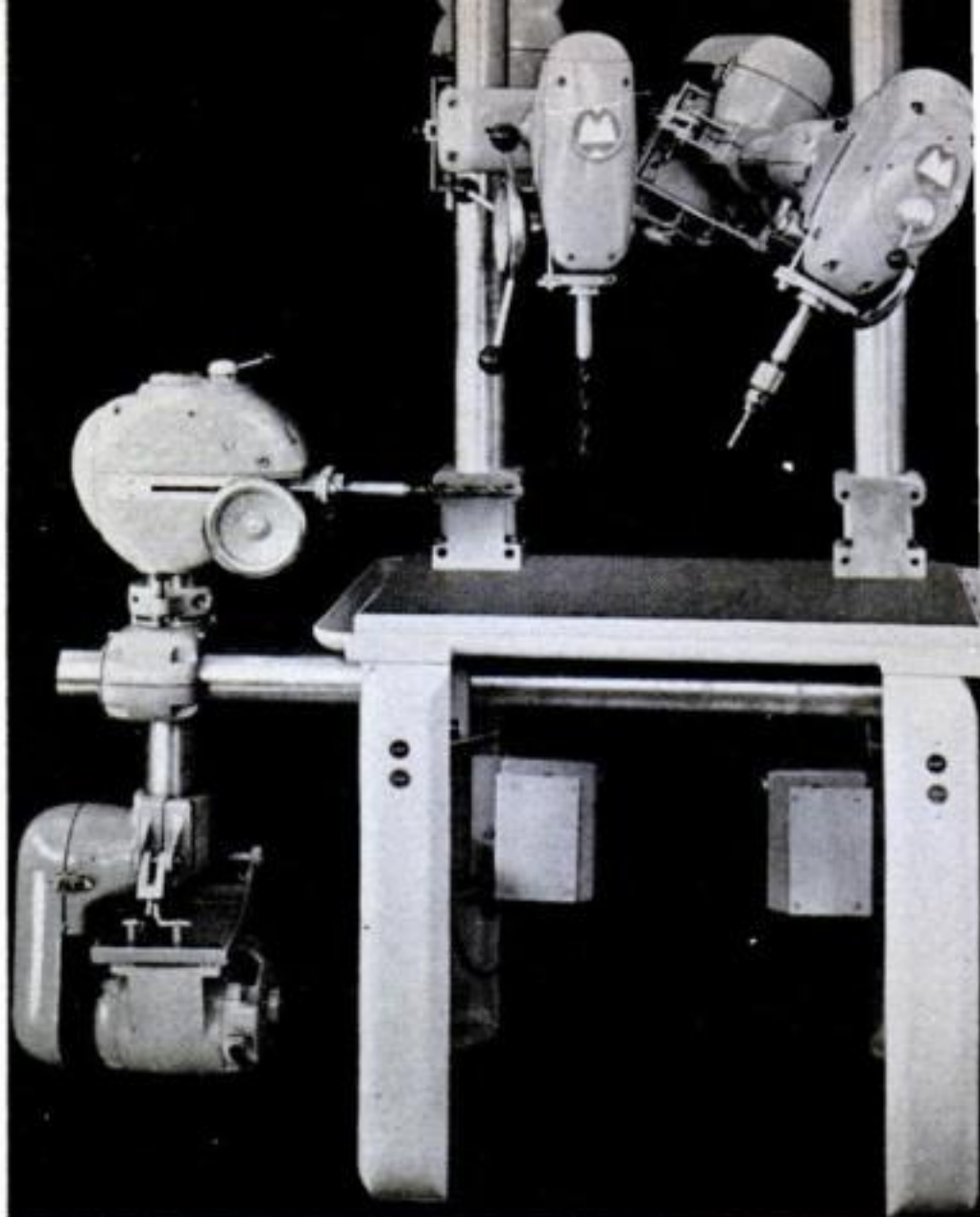


TABLE for multiple drilling of parts held in jigs has mounting bosses underneath, as well as on top, to permit horizontal drilling.

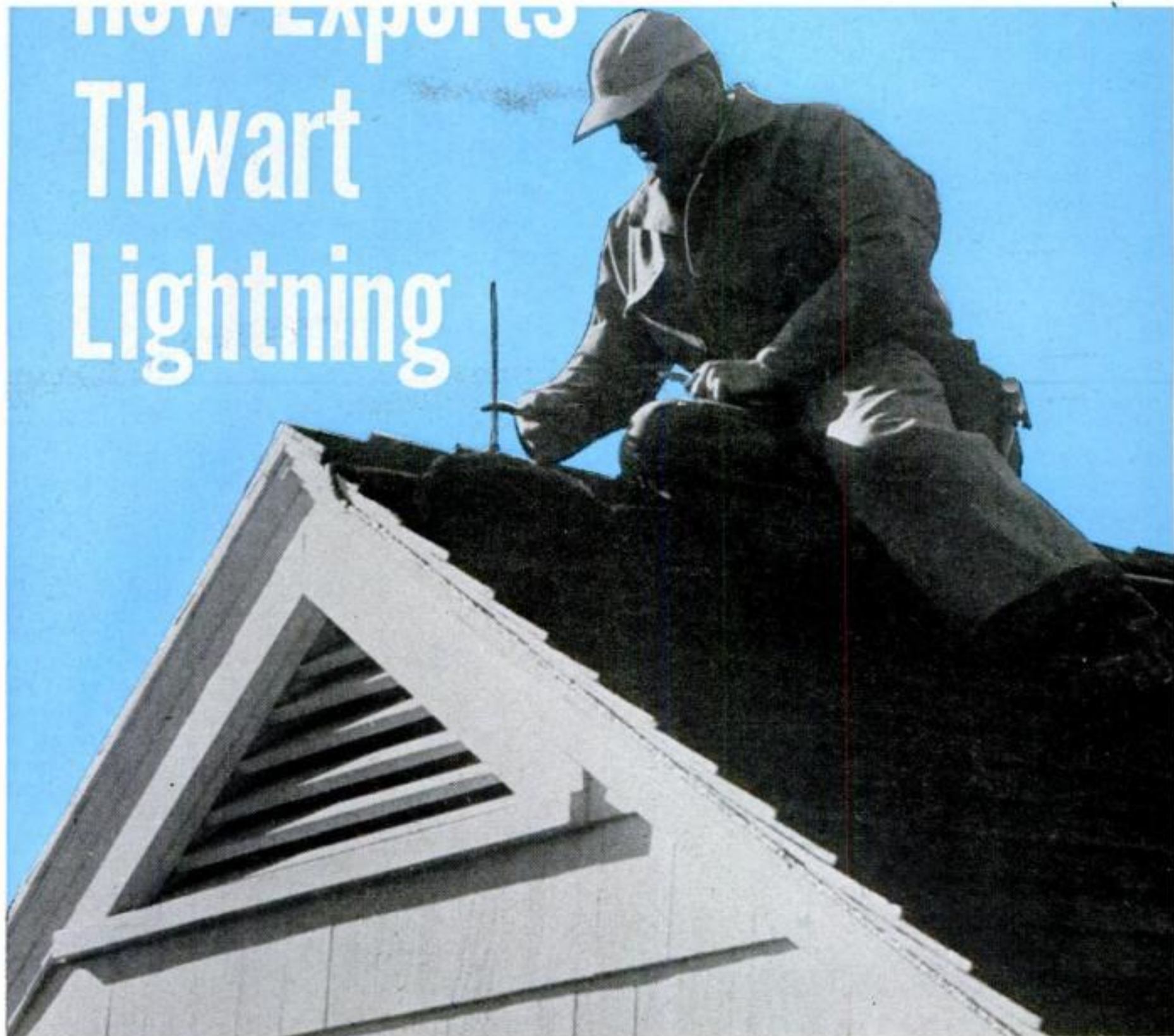
CAM RIG offsets motor one V-belt width, giving seven speeds from the four-step pulley. Spindle drive through connecting tube adds safety.

One-Man Helicopter May Be Army Workhorse—Pony Size

A collapsible 'copter that can be packed in a container and parachuted from a plane is being tested by the Army for air evacuation and observation. It can be unpacked and put in the air in about 20 minutes. Evacuees would ride litter carriers on outriggers. Two pulse-jet engines mounted on the tips of the blades (PSM, May '50, p. 116) give the craft a top speed of 80 miles an hour. The American Helicopter Co., Los Angeles, designed it.



How Experts Thwart Lightning



Ten-inch rods are only things that are visible from front. Cables all go down the back way.

A house is ready to shrug off the mightiest bolts from the skies when they finish installing rods and grounding pipes and wires.

PSM PHOTOS BY W. W. MORRIS

EVERY year lightning sparks fires that destroy more than \$52,000,000 worth of property in the U.S. In rural and suburban areas it is the No. 1 firebug. Cities are less hard hit, but throughout the nation, lightning is second only to defective flues as a cause of fires in homes.

You can't stop lightning but you can give your home better than 99-percent protection with a properly installed lightning-rod system. The photos on the next three pages show an expert installation by the Woods Lightning Protection Co., Shelton,

Conn., on the Long Hill, Conn., home of architect A. J. Hawley.

Lightning strikes when static electricity jumps the air gap between earth and a cloud. The electricity wants only to discharge itself and seeks the easiest path. Lightning rods perched on the high points of a building offer it an attractive road.

Lightning rods were invented by Ben Franklin just 200 years ago. They haven't changed much since then, but modern installers have added a whole bagful of tricks for concealing rods, cables and links so that they won't mar the appearance of a building.

Please turn the page for lightning-protection photos.

MAY 1952 155



1 CABLE IS STRUNG along roof and down both ends of house. Truck-workshop carries fittings to suit all structures.



2 RIDGE SADDLE nailed to peak will hold rod. Underwriters' Laboratories sets rules for number of rods and spacing.



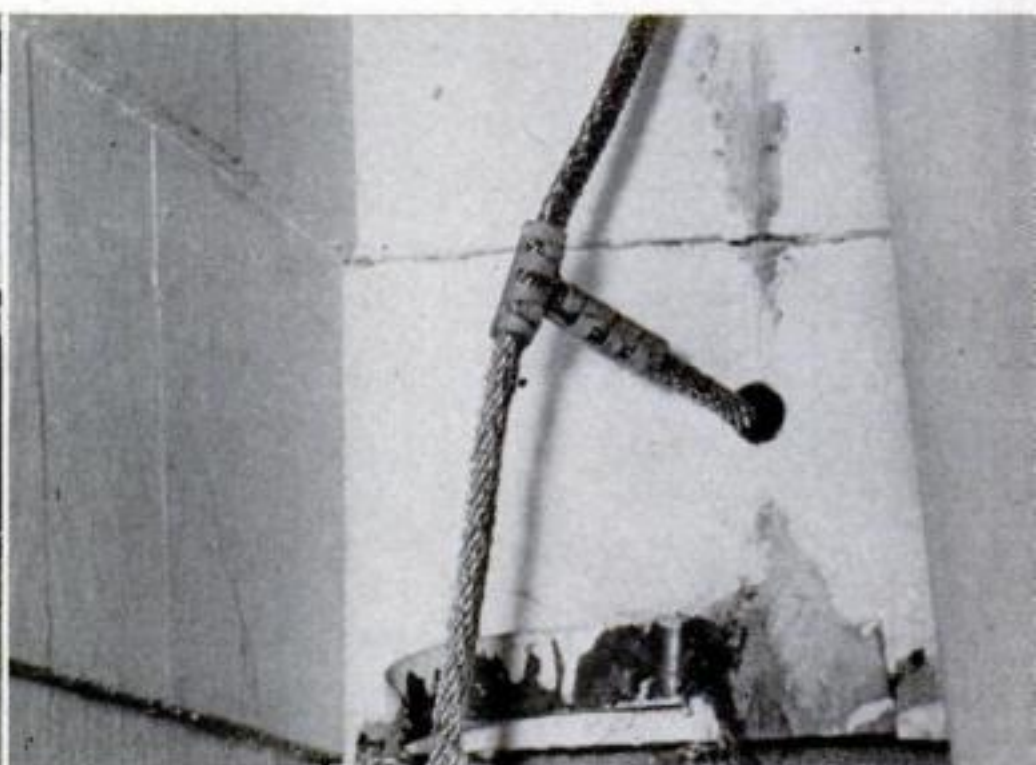
5 TWO TERMINALS are needed on this chimney. Rule is that rod must be less than two feet from any corner. Rods are cabled together.



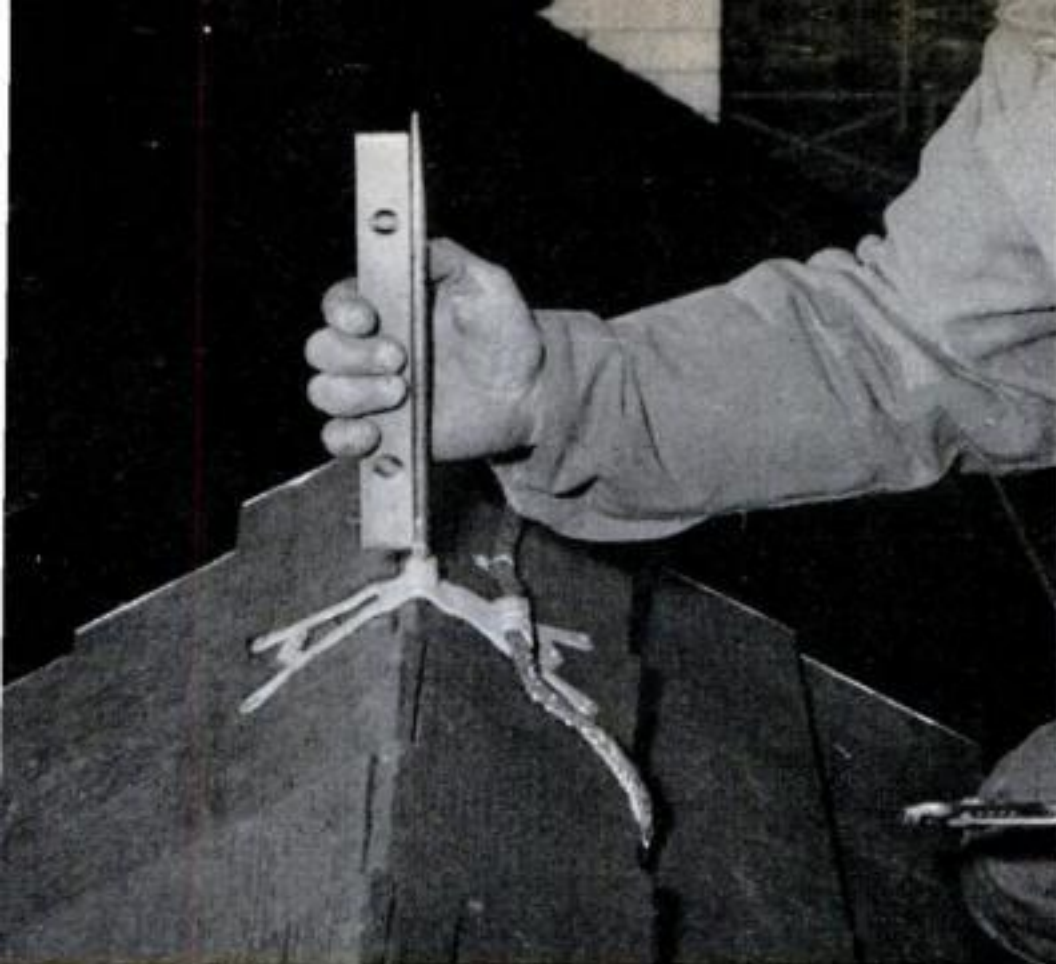
6 TV ANTENNA MAST is connected to rod circuit with copper strip. Cable, 32-strand, 17-gauge copper, can handle any stroke.



8 CABLE goes under eave. One man pulls it tight while another nails and clamps it. First paint job will hide it completely.



9 TEE CONNECTOR joins main cable with branch that goes through cellar wall. Downspout has been unhooked, moved to one side.



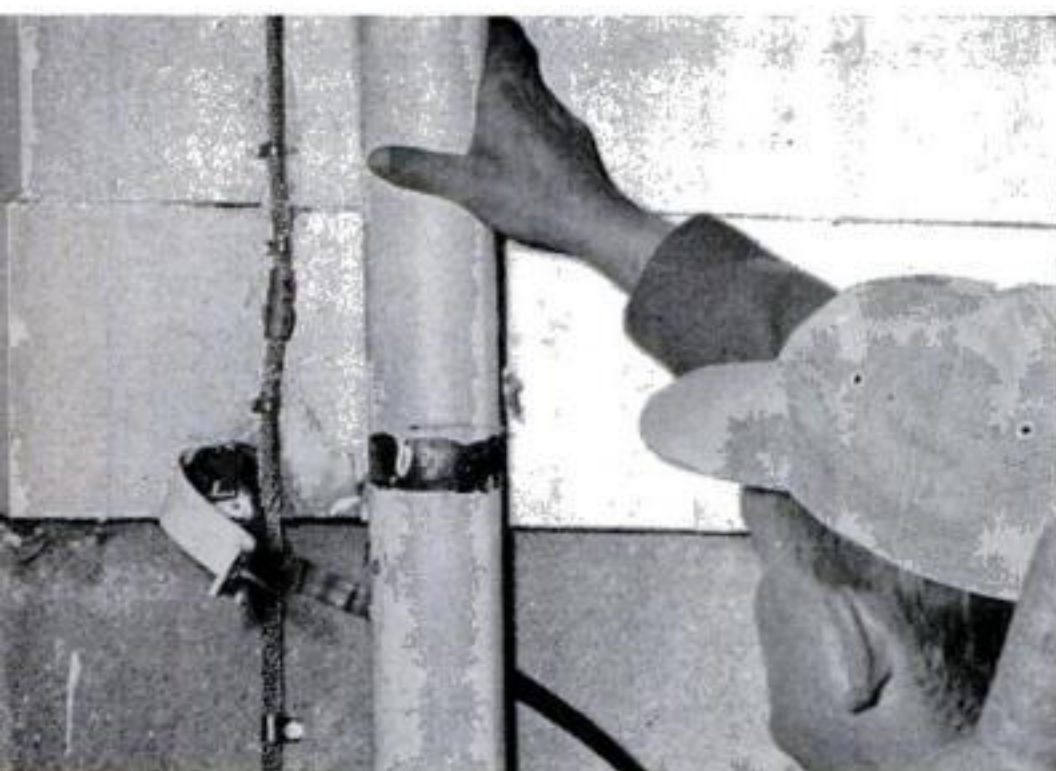
3 **LIGHTNING ROD**, called "air terminal," is threaded into saddle and leveled. Copper rods are lead coated to resist chimney fumes.



4 **CHIMNEY IS DRILLED** for lead anchors that hold masonry saddle. Chimneys, favorite lightning targets, are always rodded.



7 **ROOF VENT** is interconnected, or "cross-bonded," too. Metal like this acts as lightning rod but would carry charge into house.



10 **WOOD FILLER** seals hole where tee goes through wall. When downspout is replaced, it will hide the cable.



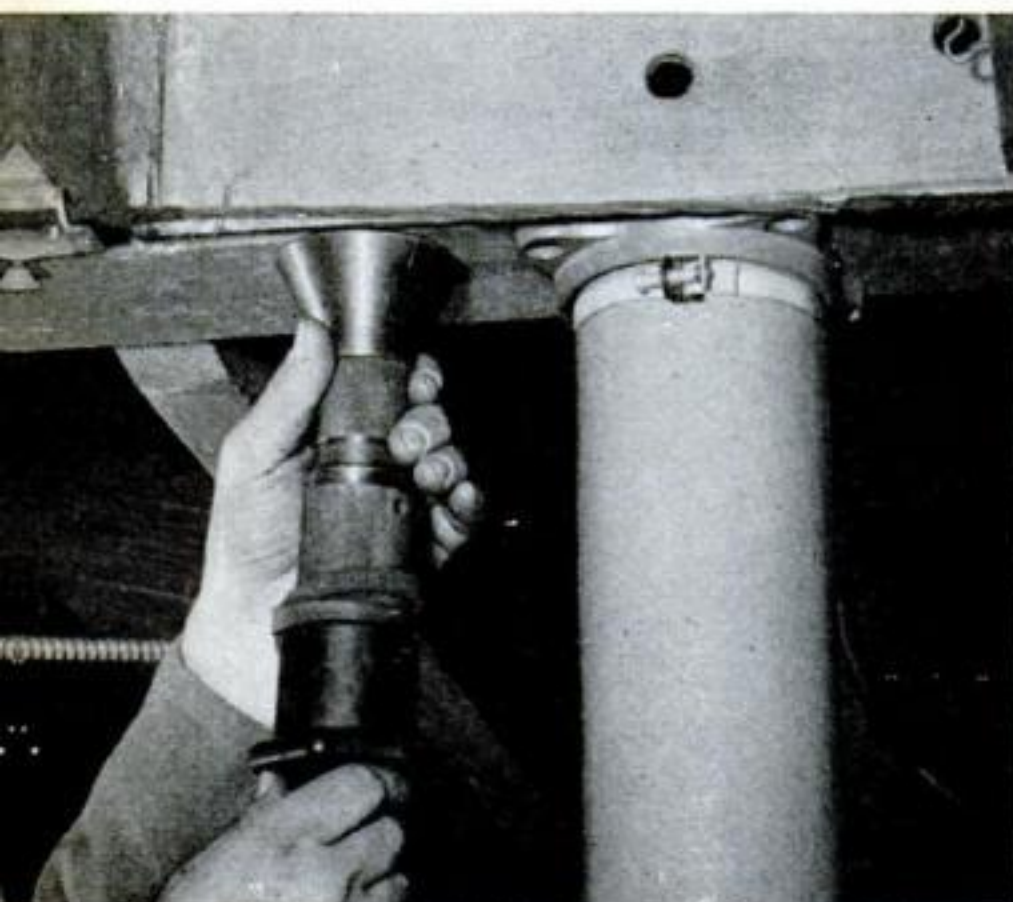
11 **GROUND BAR**, a 10-foot copper rod, is driven with an electric hammer. It is joined to cable below ground as shown on next page.



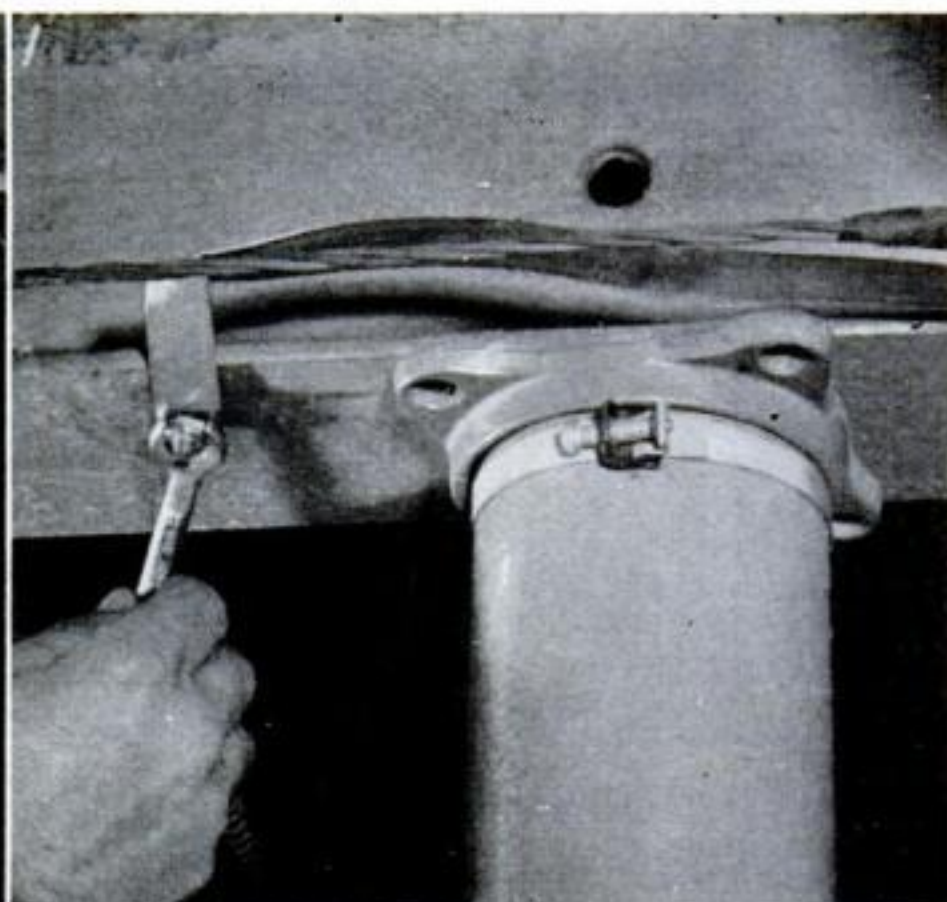
12 GROUND-BAR CLAMP links cable and rod a foot or so below ground. At least two grounds are used; this house got three.



13 CELLAR BRANCH CABLE is bonded to water pipe. Clamps, tees and connectors are specially made, can stand 2,000-pound pull.



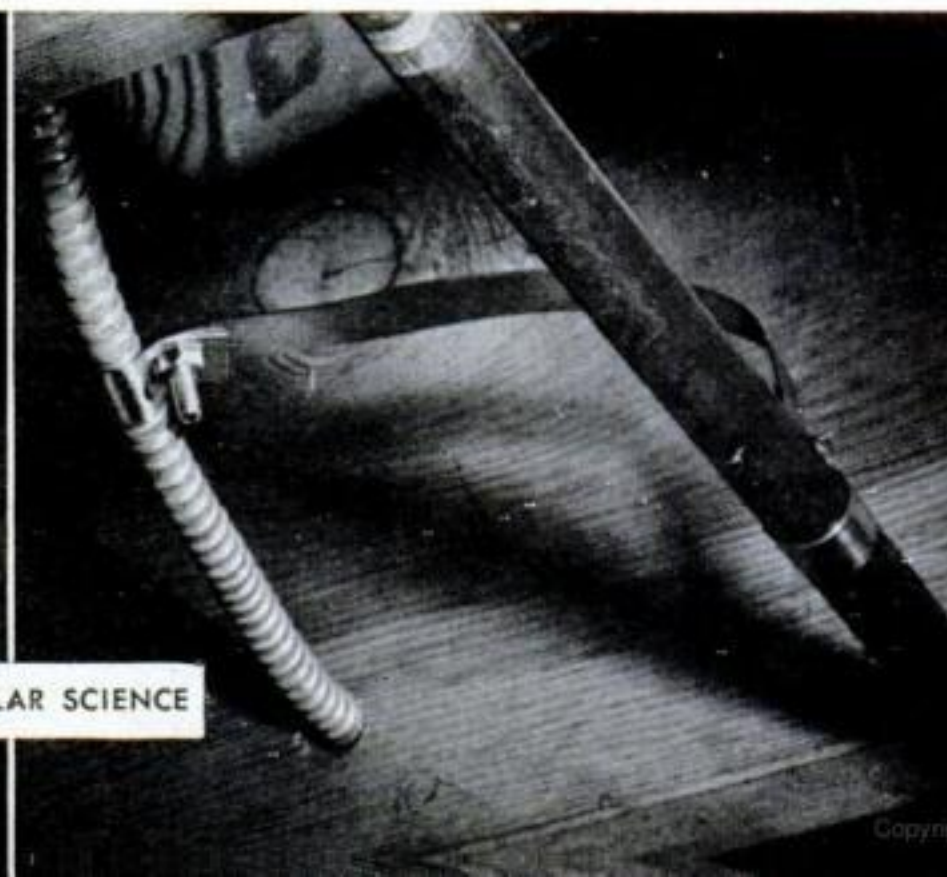
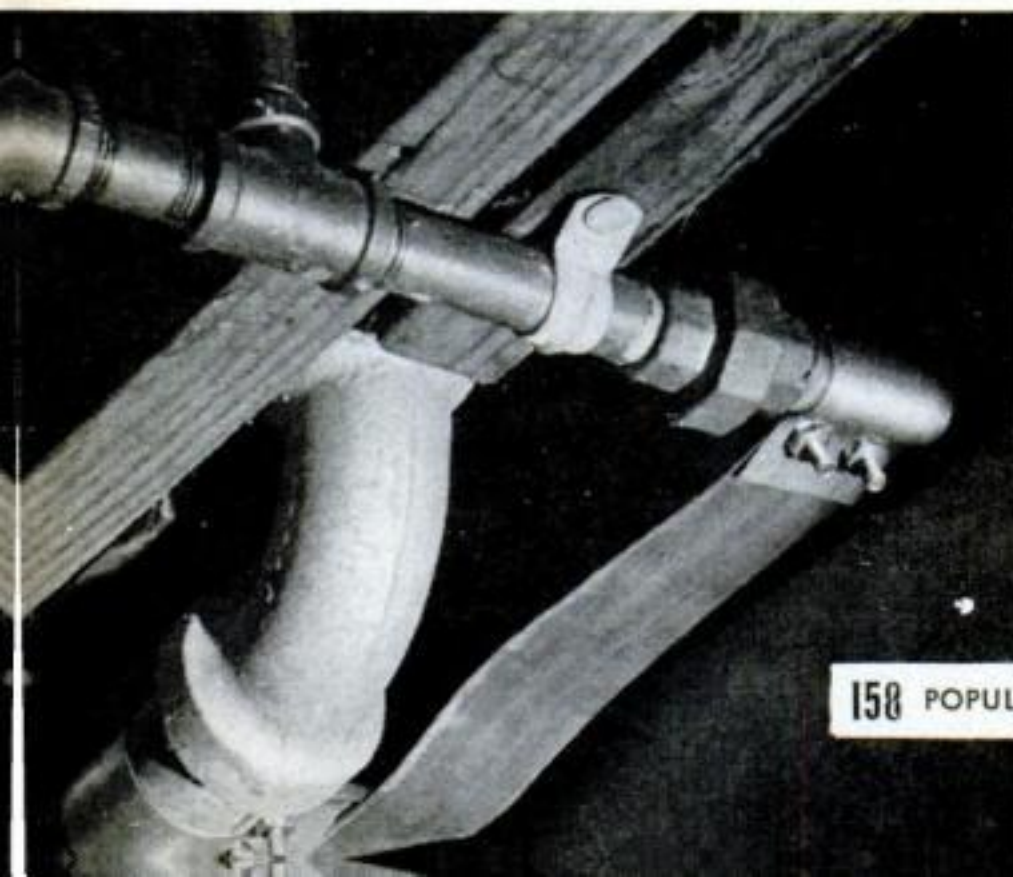
14 POWDER-OPERATED GUN shoots a threaded stud into steel girder for ground connection. Metal must be interconnected.

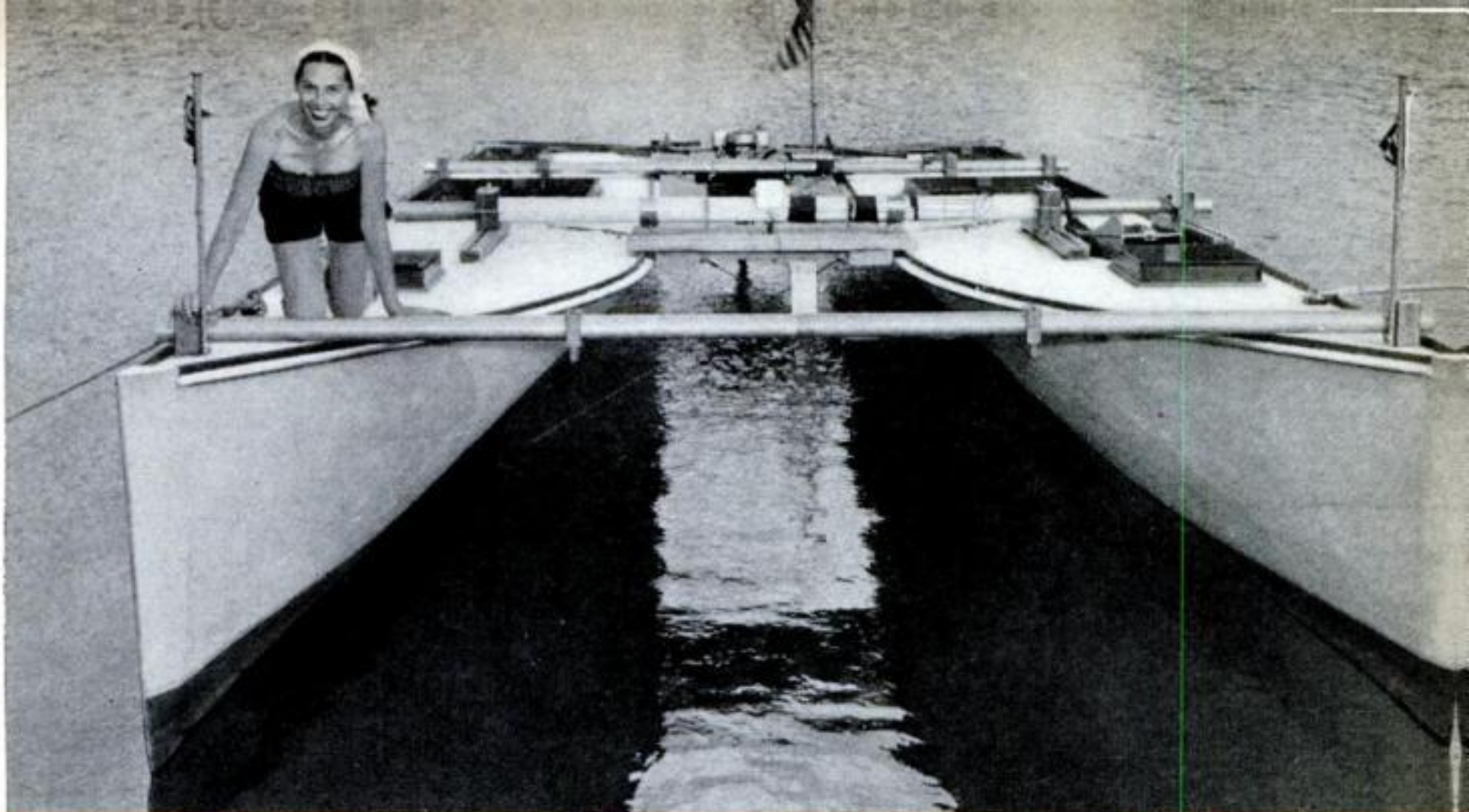


15 GIRDER and supporting columns are bonded into single ground system by copper strip bolted to threaded end of stud.

16 DRAINS are tied into circuit in cellar. Plumbing is cross-bonded at several places to by-pass any high-resistance joints.

17 HOUSE WIRING—already grounded—is bonded to complete circle. Now neither static nor lightning can spark metal. **END**





Bow view shows two 4½-foot hulls linked by aluminum tube and cable to give 12-foot beam.

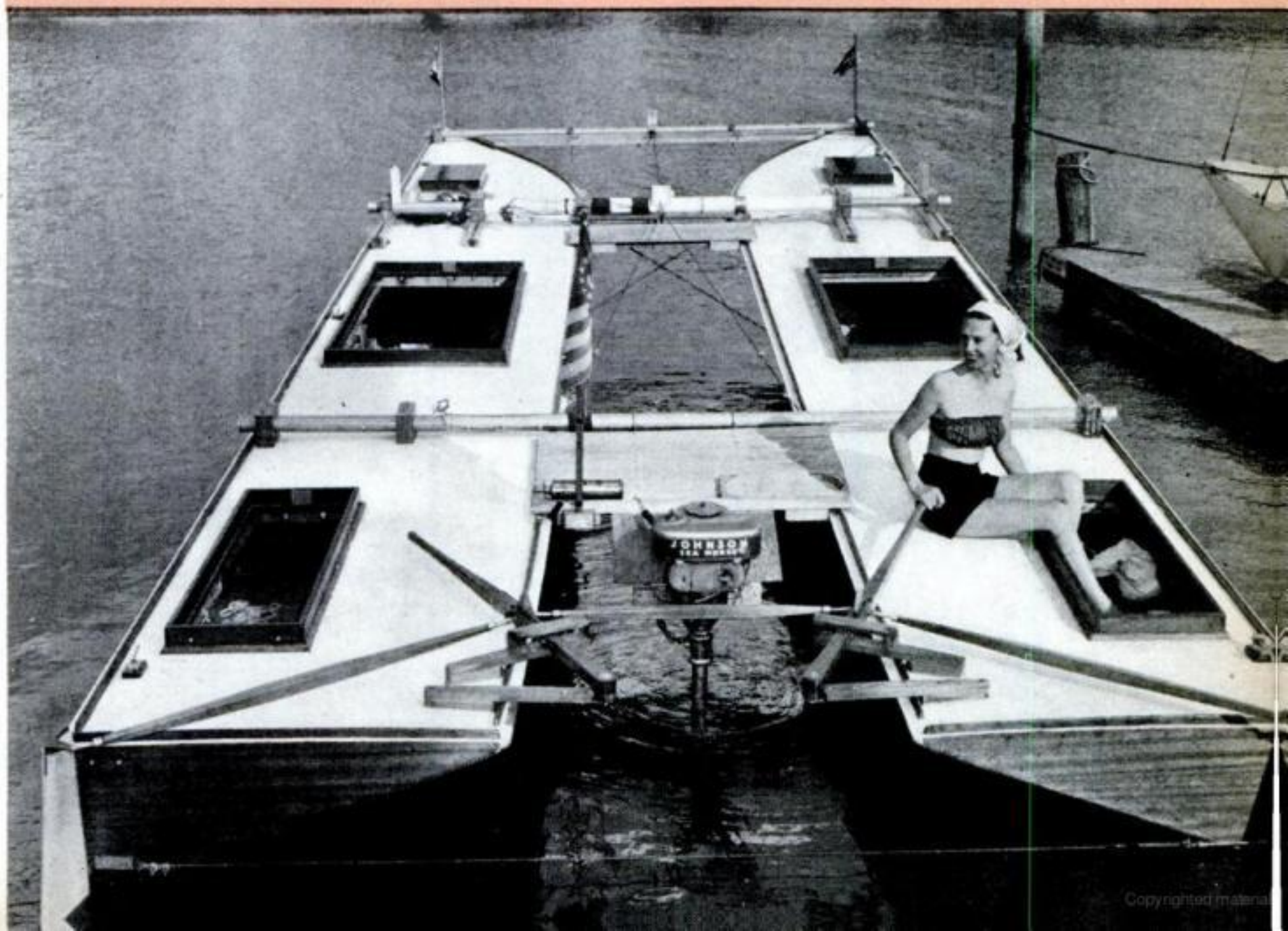
Twin-Huller Built for Speed

MEET the latest in catamarans—the good ship *Tweedledum-Tweedledee* of Detroit. Her slim hulls, 35 feet long, are designed to give the cabin space and seaworthiness of a 28-foot, L-class sloop—but with twice the speed when under sail.

Owners and crew of the *T-T* are Dr.

Arthur Locke and his wife Dorothy (in photos). They built her with the help of friends, students and faculty at Wayne University, where Dr. Locke teaches aeronautical engineering. Like Gar Wood's *Venturi* (PSM, Nov. '49, p. 106), the *T-T* has hulls that are flat outside, curved inside.

Stern shot shows outboard mounting. When sails are added, craft will be sloop-rigged.



P.S.

Last minute news & notes...

SPACE-CADET SUITS will have to be made in smaller sizes--mice and monkeys are getting the first high-altitude rocket rides. They've ridden as high as 80 miles and survived gravity-less free falls with no significant effect upon heart and blood vessels.

AMONG THE STRONGEST WOODS known is a tropical hardwood from the kaneelhart tree, "Licaria cayennensis," of Central and South America, Prof. F. F. Wangaard of Yale University has discovered. He foresees its use for tool and utensil handles, thresholds for doorways and a variety of turned-wood articles. The exceptionally heavy wood can be finished mirror smooth.

TEN TIMES FASTER THAN SOUND is the record velocity of air in a wind tunnel at White Oak, Md., used by the Naval Ordnance Laboratory to study missile and projectile design. Supplied from a reservoir holding it under a pressure of 3,000 pounds to the square inch, the air must be preheated to prevent the wind tunnel from liquefying it.

RESILIENT CONCRETE FLOORS that won't crack, and "an ideal mortar" for brick or tile, are obtained by using concrete or mortar containing 20 percent of polyvinyl acetate (used to make plastics), MIT scientists report after trials of it.

STOVES that cook meals in a few seconds with ultra-high-frequency waves are one of the features of the coffee-shop cars on the new "Congressional" trains now plying the Pennsy's New York-Washington route.

THULIUM, rare-earth element, has a new use. Made radioactive in an atomic pile, it can replace bulky X-ray apparatus for making radiographs of patients' bones and teeth. Its rays do not harm body tissue.

NEW PRODUCTS: LEATHER MADE FROM BACON RINDS has yielded soft, pliable and low-cost work gloves for telephone linemen . . . A new CERAMIC PERMANENT MAGNET requires neither cobalt nor nickel, both strategic materials in short supply.

SPARE PARTS FOR THE HUMAN BODY still can't be ordered from a catalogue, but developments over the past few years have made possible an ever-increasing number. Like the blood bank, there are now banks for eyes, bone, cartilage, arteries and veins. Entire organs, such as kidneys and bladders, have been transplanted or constructed from a patient's own tissue. And now man-made organs, like the mechanical heart and kidney, are keeping alive the spark of life until natural organs can be repaired.

NEW ANTI-TB DRUG took a million man-hours and a million and a quarter dollars in research and experiment, reports Squibb, which developed it simultaneously with Hoffman-La Roche. The drug, isonicotinic acid hydrazide, was found to kill TB germs in a routine test after it was synthesized for other purposes.

FIRST ALL-JET AIRLINE SERVICE is just starting. British Overseas Airways is putting de Havilland Comets on the London-Johannesburg run May 2. Cruising up to 490 m.p.h., the jets will make the 6,724-mile trip in 23 hours 40 minutes--clipping 13 hours off the present schedule.

SCIENCE FICTION'S favorite stuff--"contraterrene," matter containing positive electrons instead of the negative ones all earthly matter is made of--has actually been discovered. At least a man-made "element" very like it was described to the American Physical Society by MIT's Prof. Martin Deutsch. He calls it "positronium" and says it consists of just two electrons (one positive, one negative), making it the only "atom" without a nucleus. Just as the science-fiction boys predicted, this form of CT blows up --in 1/10 of a millionth of a second or less.

The Editors



MECHANICS *and* HANDICRAFT

REG. U. S. PAT. OFF.

How Good Are Your Gutters?

Here's the low-down on roof-drainage systems: what you need; what's available; how to repair, install or even make them.

RAIN on the roof may come down as drops, but it runs off as gallons. That's a lot of water over the eaves, and if it pours off them without benefit of gutters, you'll soon have a miniature moat around the house. Water-soaked ground by the foundation walls is a good start toward a damp basement.

Just having gutters isn't 100-percent insurance against these troubles. Like practically everything else, gutters need loving care. Without it, they clog, leak, spill water and sag to give a house a raffish, unshaven look. The bright part of the picture is that the problem isn't hard to lick: if you don't have gutters, they are fairly simple to install, and if you do have them, repairs are

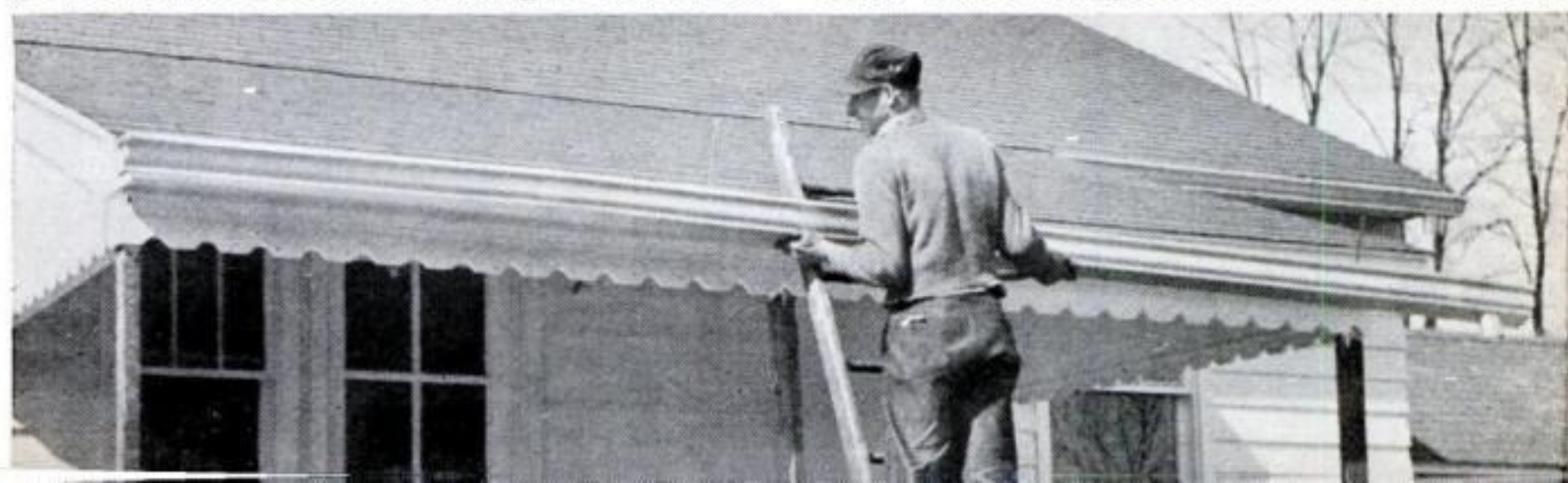
mostly routine ladder work, not at all difficult once you get at it.

Kinds of gutters. In selecting new gutters, consider the style of your house, how much you want to pay and how much maintenance you are willing to put in. These are the kinds you'll have to choose from:

Galvanized. This is the cheapest gutter, costing roughly \$2 for a 10' length. It will rust through, though, and isn't recommended for damp climates, coastal areas or places with industrial or railroad smog. If painted at least once a year, galvanized will nevertheless last for years. The material takes solder beautifully, but if you aren't a hot man with an iron, you can use slip connectors. These are short sections with a zigzag

THIS WON'T DO. Roofer's version of painting yourself into a corner is leaning ladder on the

eaves where gutter has to go. This lad must come down with gutter and reset the ladder.



fold on each side that you push the gutter troughs into.

Aluminum. This will cost you about twice as much as galvanized. But it needs no painting, lasts a long time, resists corrosion and won't stain or discolor house walls if it should leak. Its light weight makes it easy to install, which may be important on a one-man job.

Being soft, aluminum gutter must be handled with care. It also requires hangers closer together (and therefore more of them). It can't be soldered, but is assembled

with slip connectors. Both a smooth and an embossed or hammered finish are available.

Stainless Steel. This costs about two and a half times as much as galvanized. But it requires no painting, doesn't stain and resists corrosion. It is the strongest metal gutter, and so withstands ice, snow and abrasion by tree branches better. It can be soldered or installed with connectors.

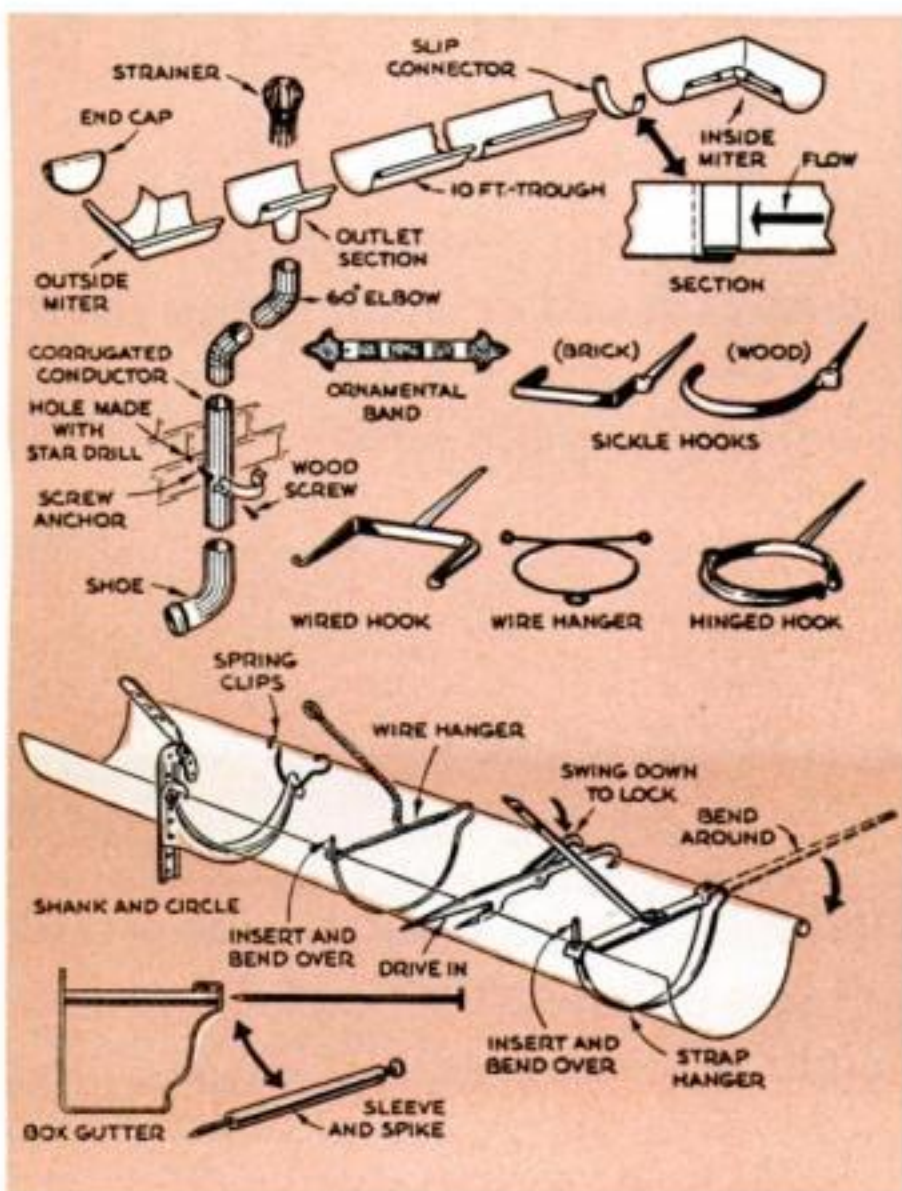
Copper. Copper gutter has been used for centuries. It costs about three times as much as galvanized. Defense needs have stopped the manufacture of it now, but you may

Slip Connectors Make It Simple to Install New Metal Gutters

You'll save time and energy by finding yourself a helper with a second ladder. However, if you must work alone, build the temporary support shown at the bottom of the facing page.

Roofers often solder gutter together before

hanging it. Slip joints won't hold full lengths securely enough for this, but you can attach outlet sections, miters and end caps on the ground. Smear the grooves of the slip connectors with cement and force the parts in.



IF HANGERS ARE NAILED over the shingles, don't fail to embed the heads in sealing compound. Drive nails only part way, apply asphaltum cement around and under heads, and drive in.



CORRECT PITCH, or slope toward outlet end, assures runoff in metal gutters. As little as 1/16" in 1' will serve. There should be no low spots for water to collect in.

IF YOU SOLDER joints, be sure to neutralize the flux. Rinse with a solution of washing soda. Roofers use a soldering iron. A torch may burn the zinc off galvanized iron.

SLIP CONNECTORS make you an expert in joining gutter sections. Here's how an outlet section is connected to a 10' length. Put cement in the connector grooves first.

TO CUT ODD LENGTHS of gutter, first saw through the rolled edge like this. Use a fine hacksaw blade (32-tooth). Finish by cutting from the opposite edge with tin snips.



find some in dealers' stocks. It needs no painting, and weathers to a soft green. But it may stain light-colored walls if leaks occur. This can be prevented by varnishing or lacquering the gutters, but the coating must be renewed from time to time.

Copper solders well and is easy to work. However, long runs should *not* be soldered, because expansion may spring the joints. Slip connectors permit expansion.

Wood. This is also an old stand-by, and remarkably durable. Costing about the same as stainless steel, wood gutter is made mainly

from fir, but sometimes of red cedar. Architects often prefer it because it can be installed without any slope, preserving the horizontal lines of a house.

Wood gutter is very strong and unaffected by damp or corrosive atmospheres. It must be painted regularly. Joints are made by nailing or screwing sections together, but since lengths run up to 40', fewer joints are needed. Metal downspouts are usually used, but wooden ones are available.

Your pick of shapes. Wooden gutters usually have a molded front. Metal gutters

If you use hangers that clamp around the gutter, put them on now—no more than 30" apart for aluminum, 36" for other metal gutters. Shank and circle hangers are attached to the roof, and the gutter laid in.

With soldered joints, it is important to neutralize the flux immediately. Flush with a solution of washing soda. Even stainless steel can corrode if this isn't done.

Lift the gutter into place and secure it temporarily with just a few nails. Put on the next connector and press in the following length of gutter. It is usually best to put up an entire run without driving fasteners in all the way. Then pitch can be checked by pouring water in at the high end. Correct any low spots, and drive the fasteners tight.

Nail strap hangers to the roof, over rafters if possible. Although hangers should go under the shingles, you can nail them on top if you smear roofing cement liberally under the nailheads before driving them down. Where practicable, the gutter can also be nailed to the rafters or frieze board. Finally, calk the inside of the slip joints with roofing cement.

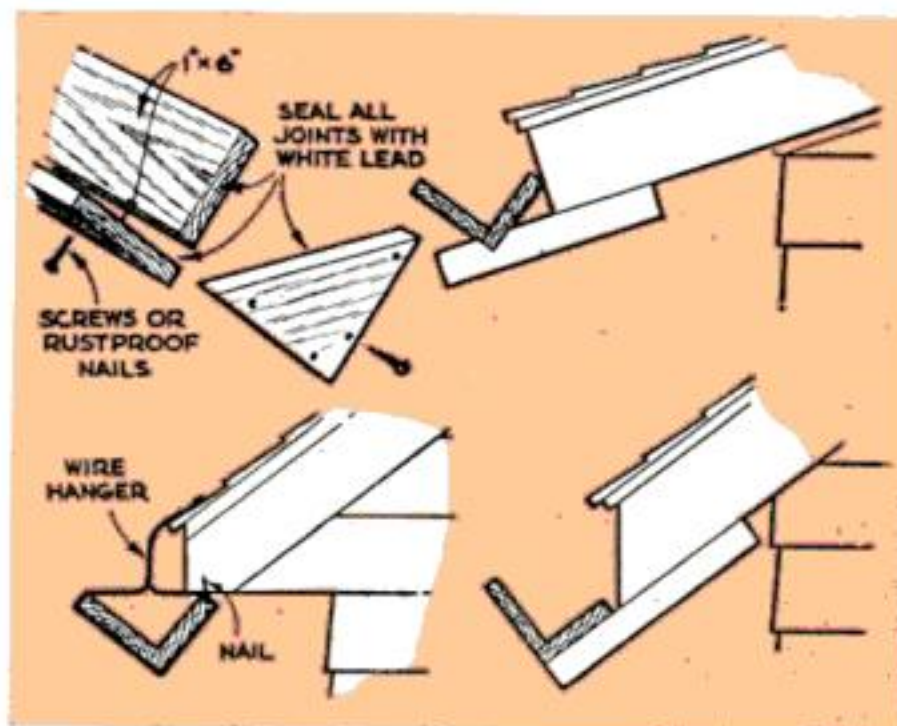
Use a pair of elbows to bring the downspout flush against the wall. Always assemble downspout with the upper section inside the lower. On masonry walls, downspout bands or wire hangers must be held by screws driven into lead anchors. Various drive hooks are also available, both for masonry and for wood. These are simply hammered in.

Remember that bands, hooks, nails and all other fasteners should be of the same metal as the pipe. Where pipe or gutter must touch another metal, coat it heavily with asphaltum.

To lead water away from the foundation, a reinforced elbow (called a shoe) emptying on a stone or concrete splash block is a minimum arrangement. A run of buried drain tile with open joints is good in sandy soils, or water may be led to a storm sewer or dry well (PSM, Feb. '51, p. 183).

The oil left on metal in the rolling process must be cleaned off with gasoline or naphtha before painting. Galvanized gutter must then be washed with dilute acid, such as vinegar. Some roofers recommend doing this and letting the gutter weather a few months before painting it. Use a primer and regular outside paint on the exterior, primer and asphalt paint inside.

V Gutters Made of Stock Lumber

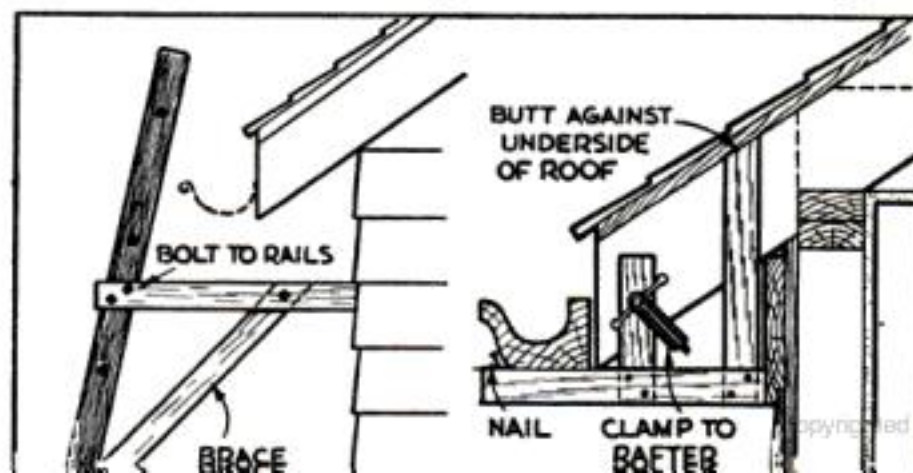


HOMEMADE V GUTTER is serviceable if well built and properly installed. Remember ice will add a heavy load in winter, so secure the inner edge with rustproof nails or screws. Calk the long joint with asphaltum cement.

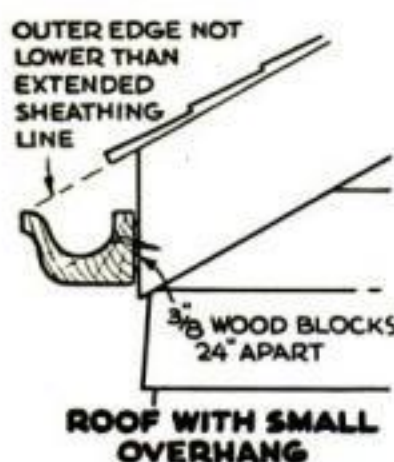
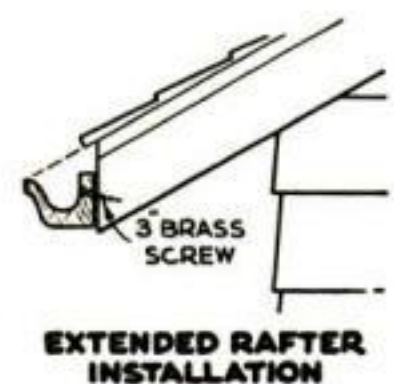
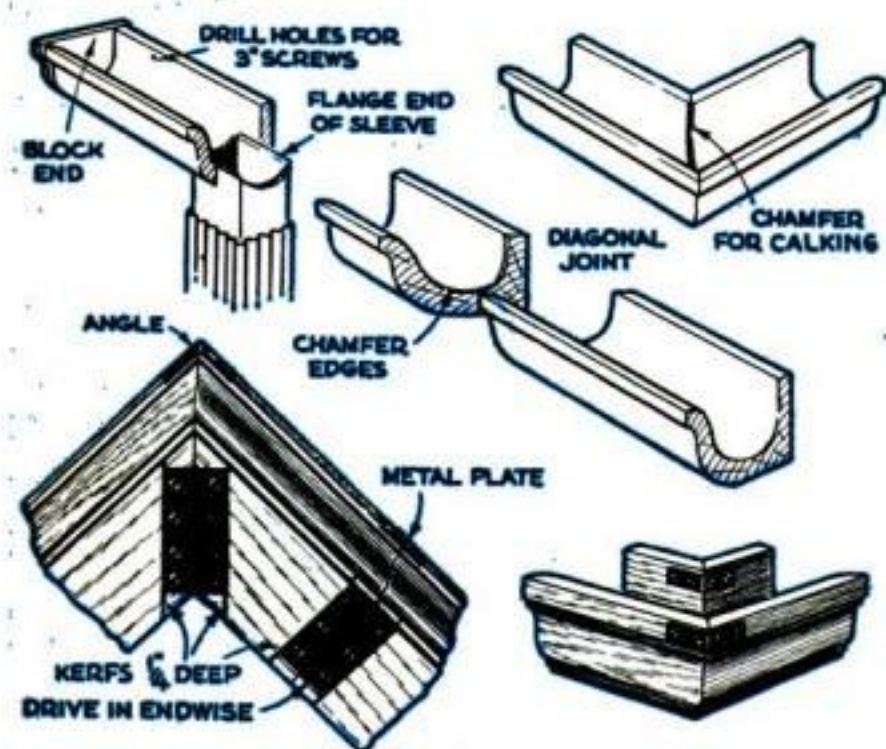
A SIMPLE but practical V gutter can be made from stock lumber. Far from being a mere makeshift, this type has been used from Colonial days, and is often specified by architects today on Colonial-style houses.

Red cedar is excellent, but fir or cypress will do also. Coat joining surfaces with white lead before screwing them together. Prime all over with linseed oil, and calk the inside of the joint. You can use metal downspouts or make square ones out of wood.

SET LADDER OFF from eaves to hang gutter. A piece of wood bolted to each rail as at left below does the trick. The brace isn't needed if the spacer is short. A temporary support made from three pieces of wood (right below) will hold one end of gutter on a one-man job.



How to Install New Wood Gutters



WOODEN TROUGHS can be protected with linseed oil alone. You can use asphaltum too, as above, but watch it for cracking and renew it as necessary. Chamfer all joints for calking.

BECAUSE wood gutter is heavy, a helper is almost a must. Cut, fit and make joints on the ground. Smear the edges of all joints with white lead and assemble with rustproof nails or, better still, countersunk brass screws. For the metal fasteners shown in the drawing, a kerf must be cut in each piece.

Wood gutters are nailed or screwed directly on the house. The drawings show two methods of attaching them. It's well to coat the back edge with white lead before putting up the gutter. In climates where ice forms, set the gutters off with $\frac{3}{8}$ " or thicker blocks so that accumulated water will spill over instead of entering the wall.

Wood gutter can be put up without any slope, and will drain satisfactorily provided it is kept clear of leaves.

For downspouts, cut a hole in the gutter and set in the metal outlet sleeve with white lead or roofing cement.

Manufacturers recommend priming the wood with white lead and linseed oil on the outside and then painting it, but using oil only on the inside. Soak exposed ends with linseed oil too. Calk the inside of all joints with roofing cement or calking compound.

come in half-round, square and box shapes. The latter has a curved front and a square top edge, like a molding. Half-round is the cheapest. Others cost about 25 percent more.

Don't mix metals. You can use part wood and part metal gutter, but don't join two kinds of metal gutters. Acids in the atmosphere will set up an action similar to that in a battery, disintegrating the metal. Even nails and screws should be of the same metal as the gutter. Beware also of letting gutter touch dissimilar metal it passes.

Timely Repairs Save You Money

IN ITS own quiet way, a clogged gutter may route water into your living room for a long time without serving notice. Rather than wait for plaster to fall, you should routinely check that gutters are clear and drain as they should.

You can rest a ladder against wooden gutters. For others, use a ladder short enough to brace against the wall just under the gutter, or attach standoffs to the ladder as shown in drawing on page 163.

Leaves should be cleaned out of gutters in the fall right after trees are bare. If any have worked into downspouts and jammed the elbows, break them up with stiff wire (or a plumber's snake in bad cases). Then stick a hose down the pipe and turn the water on full to flush away the residue.

There should be a strainer in the outlet above each downspout. They're cheap and easy to install, and can save you a lot of trouble. Just push them in.

You may find downspout pipes bulged where water stood at a point clogged with leaves and then froze. If the seam is not split, you can probably force the metal back into shape. Split pipe should be replaced, but a temporary repair can be made by smearing thick roofing cement over the break. For large splits, use a cloth-reinforced patch as shown for gutters in the photos at the bottom of the facing page. It can be wired in place for extra strength.

Except on aluminum, holes and splits can be permanently repaired by soldering. Be sure to neutralize the flux with a weak solution of washing soda immediately after, or you'll soon have new leaks.

Winter loads of ice and snow may give metal gutters a permanent sag. Try to bend the gutter back into shape. Install a new hanger or two to hold it if necessary. Ice and snow guards, which keep such loads off the gutters, are a good investment if you have been troubled with such accumulations.

Paint galvanized gutters inside with asphaltum once a year, and with regular house paint outside as often as needed. Before painting, surfaces should be dry, and the inside should be cleared of leaves, twigs and the pigment residue from shingles that often gathers there. Brush off rust and scale. If old asphaltum is cracked and loose, scrape it out before repainting.

Cracked wooden gutters may have to be cut

Figuring downspout sizes. In areas of average rainfall, each square inch of downspout area can handle runoff from 100 sq. ft. of roof. If yours is a region of light or heavy rainfall, better check local practice or look at other drainage systems. The maximum roof area (measured on the slope) to be drained by a 3" round downspout is 700 sq. ft. For 3" corrugated pipe it's 600 sq. ft.

Thus, if your roof is 25' from eaves to ridge and 50' long, the area of 1,250 sq. ft.

can be drained by two 3" round downspouts, one at each end. You could also use a single 4" downspout at the center, pitching the gutter down toward it from both ends. Downspouts can also go on outside corners (where the gutter turns the corner of a house). It's generally best not to put them on inside corners or directly under roof valleys.

END

Next Month: *Expand that attic—saw a flap in the roof, raise the flap to make a dormer—and there's room for a whole apartment.*

out and replaced. Make joints as shown in the installation drawings on page 164. Small splits can be repaired with roofing cement and fabric like metal gutters. Paint the inside with linseed oil or asphaltum once a year, and the outside whenever the house is painted. Check the joints to see if calking is cracked or broken away. If it is, scrape the joint out and recalk it, first driv-

ing tight any loose nails or replacing them with wood screws.

Where downspouts enter tile drains, freezes may break the cement seals. Asphaltum cement will repair cracks, but if badly broken, the cement should be replaced. Wrap wire or screening around the downspout just below the tile pipe to keep the new mix from falling in.



OVERFLOWING GUTTERS may put stains like this on the house paint. To prevent it, clear out leaves after trees have shed, and watch during the winter for accumulations of ice and snow that may make water stand and spill over the trough.

NAILS MAY WORK OUT of joints in wooden gutters. At right, the end cap has loosened. Drive the nails back and recalk the joints inside with roofing cement. If the nails won't drive tight, replace them with brass wood screws.



ROUND DOWNSPOUT at far left split when water accumulated and froze over a leaf stoppage. Corrugated pipes will withstand the action of such freezes better than plain ones.

ELBOWS LAST LONGER, especially galvanized ones, if they are painted inside with asphaltum. Their shape makes them more prone to clogging than pipe.



TO PATCH HOLES, first wire-brush off all loose rust and scale (left above). Spread roofing cement or asphaltum well over and around the



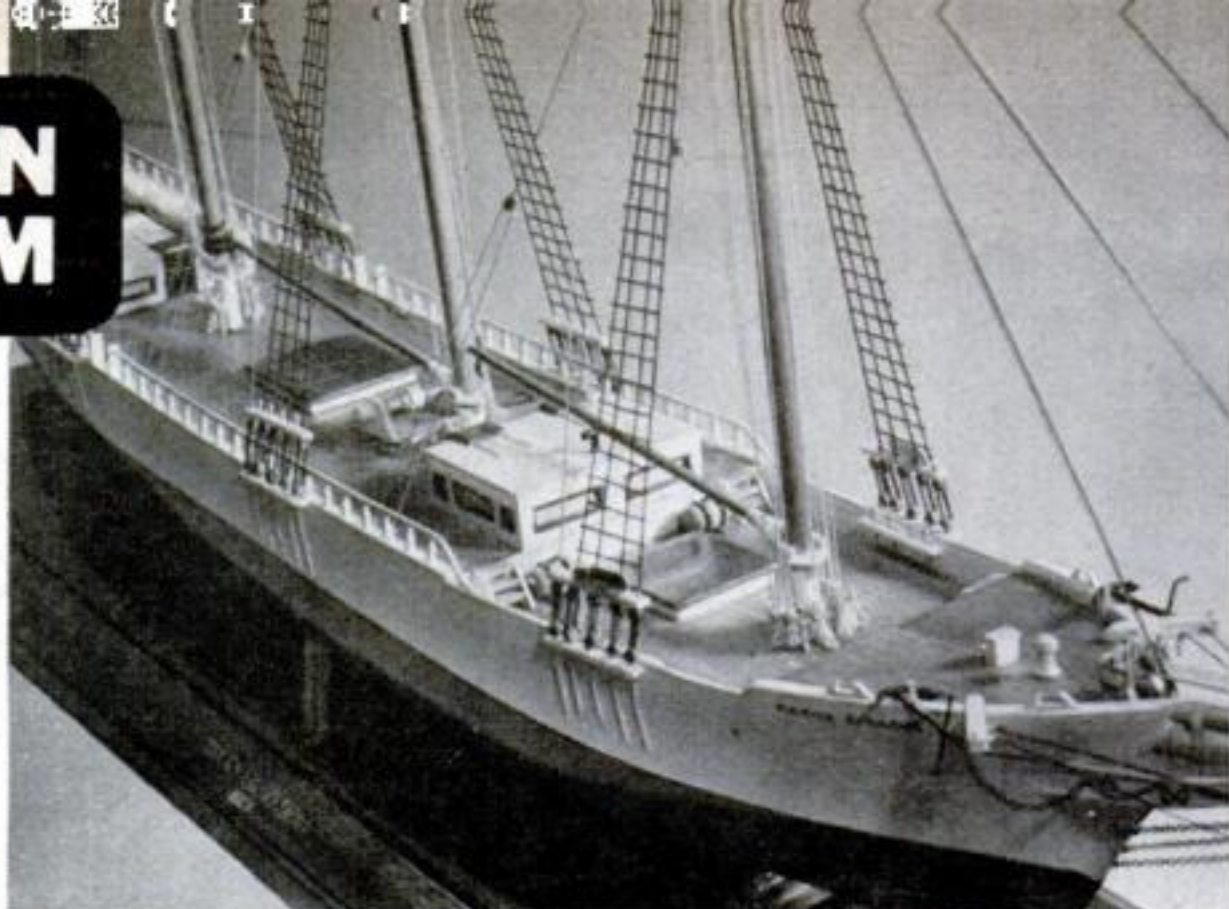
break. Lay a piece of heavy cloth in the cement, pressing it down with the fingers (center). Then brush cement on patch, well over edges.



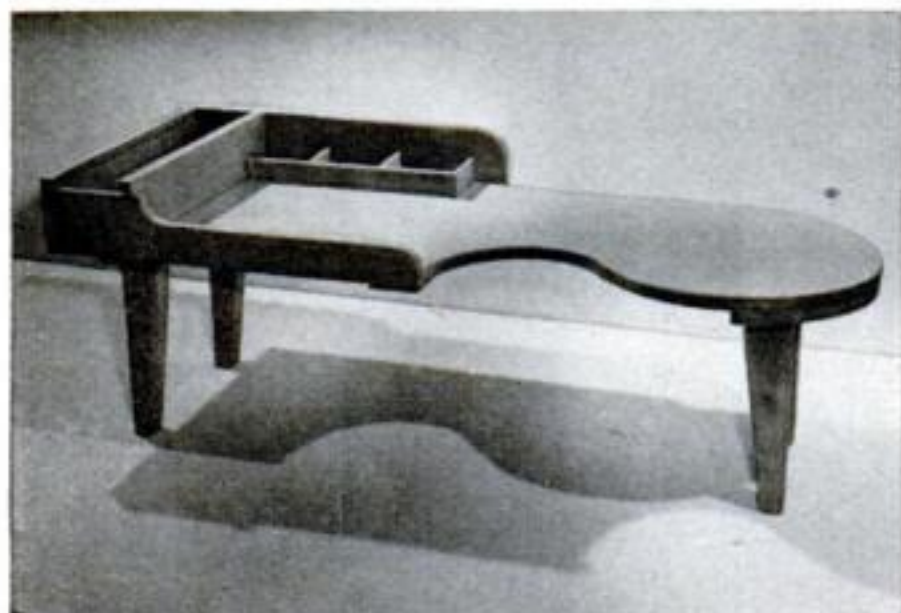
CRAFTSMEN IN UNIFORM



Ship Model. The three-masted schooner *Marion Sprague*, which sailed the seas in the Nineties, has been reproduced on a scale of 3/32" to the foot by M/Sgt. Victor Patacca, Army Signal Corps.



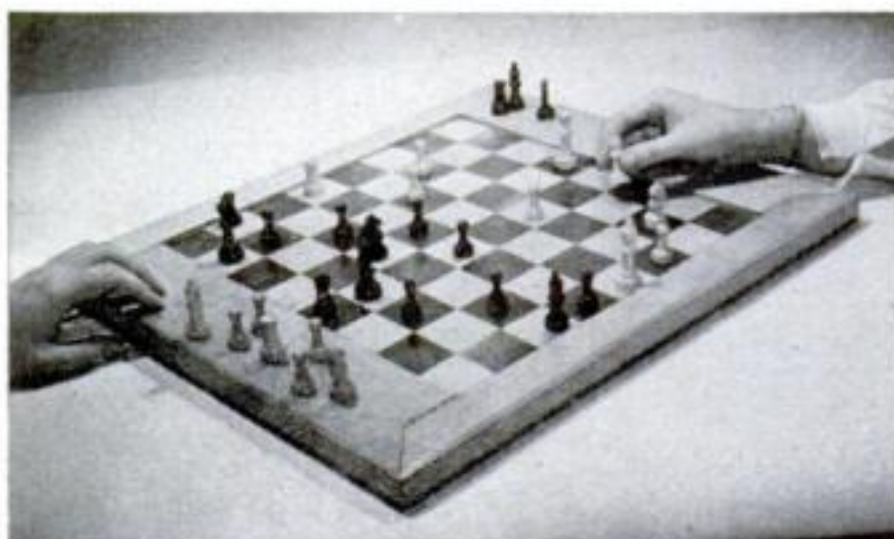
Sgt. Patacca, a member of the Utilities Section, 9404 Technical Services Unit of the Signal Student Regiment at Fort Monmouth, N. J., built the schooner of balsa wood. Note fine detail in deck fittings and rigging.



Cobbler's Bench. This 4'-long reproduction of an old-time cobbler's bench makes a fine coffee table. Air Force 1st Lieut. James S. Taylor, assistant special services officer at Mitchel Air Force Base, Long Island, N. Y., built the bench of Philippine mahogany. Working without plans, he spent a couple of months on the project, although his actual working time totaled only about five days. Lieutenant Taylor hasn't decided yet whether to line the end compartment with copper for use as a planter.

Flying Model. When S/Sgt. William H. Early of the Air Force isn't worrying about big planes he builds little ones. The gas-powered number he is holding in the picture below has been repeatedly modified as he thinks up new ideas. Sgt. Early is attached to 568 Installation Squadron at McGuire Air Force Base, N. J.

Game Board. The playing board for chess or checkers shown below is made from contrasting squares of black walnut and white maple, mounted on pine plywood. The board was made by Sgt. Ray Mowdy of the Army Signal Corps, who serves with Headquarters Company, 9400 Technical Services Unit at Fort Monmouth, N. J.





Tooled Leather Pocketbook. Here's a shoulder bag really big enough for all the junk that a gal just has to carry. M/Sgt. John F. Bellantoni of the Army Signal Corps made the pocketbook from cowhide and lined it with sheepskin. Sgt. Bellantoni, attached to Headquarters Company, 9400 Technical Services Unit, Fort Monmouth, N. J., says the bag took about two days' solid work, spread over a couple of weeks.



Radio-Phonograph Cabinet. Lieut. Col. Jacob A. Herrmann, Air Force, is shown above finishing a cabinet that will house a radio, a record player and a wire recorder. The door on the central shelf folds down to hold the recorder and player, which slide out. Colonel Herrmann, of 2500 Base Headquarters, Mitchel Air Force Base, Long Island, N. Y., also made the wire recorder that will be used in the cabinet.

Craftwork Pays Off for Men in Uniform

Riding his craft hobby during off-duty hours will earn some serviceman the King Midget car at right.

CRAFTSMEN IN UNIFORM, consisting of photographs of craftwork by men or women on active duty with the Armed Forces, will be published throughout the coming summer. For each contribution accepted, POPULAR SCIENCE MONTHLY will pay \$18.75. And the manufacturers of the King Midget will send one of their 500-pound cars—shown on the cover of PSM last November—to any address in the continental U.S. named by the contributor of the most interesting example received by August 1, 1952.

Contributions should be addressed to Craftsmen-in-Uniform Editor, Popular Science Monthly, 353 Fourth Avenue, New York 10, N. Y. Do not send anything except photographs and descriptive information. PSM will try to return contributions accompanied by postage, but assumes no responsibility for this. The editors will be the sole judges of the most interesting item. Their decision will be final.



Miniature Roller. You ride while you roll with the Motoroller (right). It is intended for use on lawns and tennis courts, and also when putting down hot- or cold-asphalt drives. The 2½-hp. unit weighs 425 lb. dry; 1,000 lb. with ballast. *E. Horton & Son Co., Windsor Locks, Conn.*



No need to strain your back with engines to furnish muscle. These



Tiny Tractor. In the spring the midget tractor at left pulls a cultivator or disk harrow; in the summer, a gang mower, lawn roller or spiker; in the fall, a leaf sweeper; and in the winter, it will push a snowplow. Also available is a trailer that will take loads up to 800 lb. The Standard-Bantam is powered by a 3-hp. engine, has a two-speed transmission and auto differential. *Standard Mfg. & Sales Co., Lebanon, Ind.*

Ride-On Mower. Sit-N-Cut (below) is powered by a 3-hp. engine that swings a rotary cutter underneath. Power is transmitted to the blade by two V belts, and to the rear wheel by gears. *Aircapitol Manufacturers, Inc., Wichita, Kan.*



Mower Also Pulls Roller. Besides cutting the grass with a rotary cutter, the Mow-Cycle (above) will pull a roller, lawn sweeper or cart. It is available with either a 2- or 3-hp. engine. *Musgrave Manufacturing Co., Springfield, Ohio.*



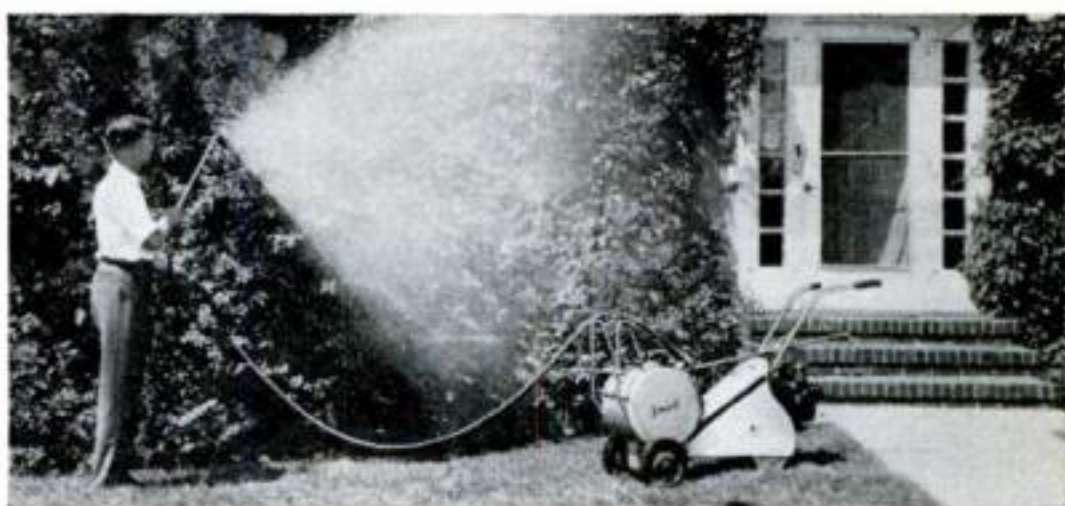
Power Scythe. A 1½-hp. engine is the muscle behind this scythe. A shoulder strap and handle bar make the 24-lb. tool easy to manage. It can be used on land or for trimming underwater weeds from a rowboat. The tool is 54" long and cuts a 20" swath. The motor will run up to six hours on a gallon of gas, the manufacturer reports. *Hoffco, Inc., Richmond, Ind.*



Baby Bulldozer. With the Mighty Mouse bulldozer you can grade and clear land, backfill, and carry loads up to 500 lb. The small machine is powered by a 6-hp. engine and has two speeds forward and one in reverse. Each track can be independently powered or braked. The scoop at the front is hydraulically operated. *Mead Specialties Co., Chicago.*

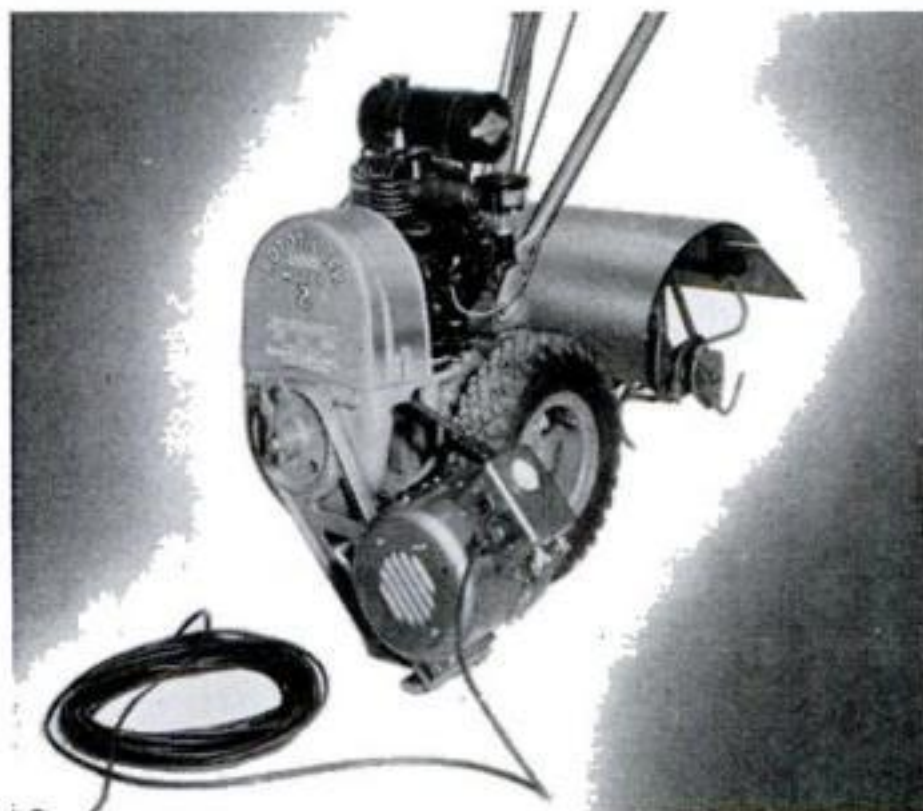
eight machines will do everything from sawing wood to bulldozing.

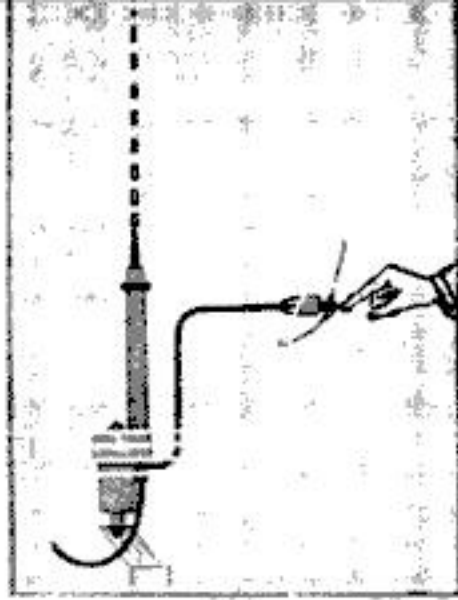
Sprayer-Cutter-Plow. With a 10-gallon spray attachment (right) bolted on in place of the sickle bar, this 1½-hp. scythe becomes a sprayer that will treat crops, control insects or disinfect farm buildings. A rotary snowplow attachment is also available. This unit is made in two models: with 1½- and 2-hp. engines. *Jari Products, Inc., Minneapolis.*



Cultivator Runs Generator, Saws Wood. These are only two of the many jobs the Rototiller will do. It can saw wood 14" in diameter. The generator attachment (left below) comes in two sizes—500 and 2,000

watts. Among the other jobs it will do are power grading and bulldozing, plowing, mowing, hauling, spraying, and pumping water. Engines of 1½, 2 or 3 hp. are available. *Rototiller, Inc., Troy, N. Y.*





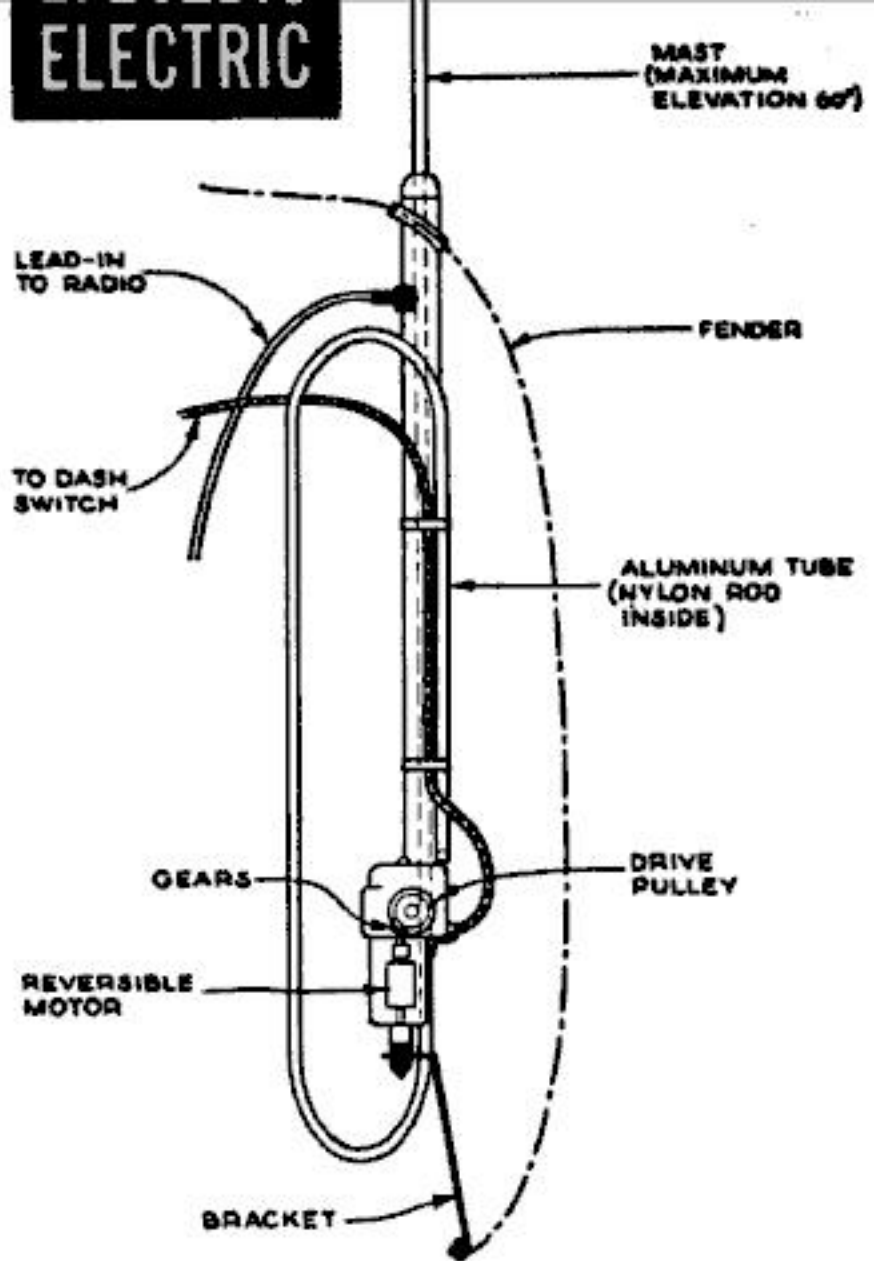
You can raise or lower them from the driver's seat just by pressing a button or turning a knob.

IT ISN'T that it takes much muscle to raise or lower a whip antenna; it's just a lot of bother. You clamber out, raise or lower the thing, wipe the grit off your hands, and then climb back in again. And if you don't, the whip either lashes through branches and whunks the garage door frame, or else protrudes so little that the music beats time to the spark plugs.

Three kinds of raising mechanisms are around now. In the newest, for Packards and Pontiacs, a flexible nylon cord inside a trombone-shaped cylinder pushes up or pulls down the telescoping mast sections when you start an electric motor. The other types, hand-controlled reels and vacuum antennas, have both been popular accessories for several years.

Like other mechanisms, automatic antennas sometimes get out of whack. So, if you now own or plan to get one, here are points to keep in mind.

Maintenance tips. On any antenna, including hand-operated ones, it is advisable to wipe road grime off the extended mast occasionally. You also will keep it working



A FLEXIBLE NYLON ROD, housed in aluminum tubing bent to trombone shape, raises and lowers a three-section mast in new electric antenna. Gear-driven by an electric motor, a spring-loaded pulley bears against the nylon rod, driving it by friction. Whether the rod shoves up the mast or pulls it down depends on which direction the motor turns. A two-way dash switch determines this. Although flexible enough to coil up inside the trombone while mast is retracted, nylon rod is stiff enough to shove mast up to full height.

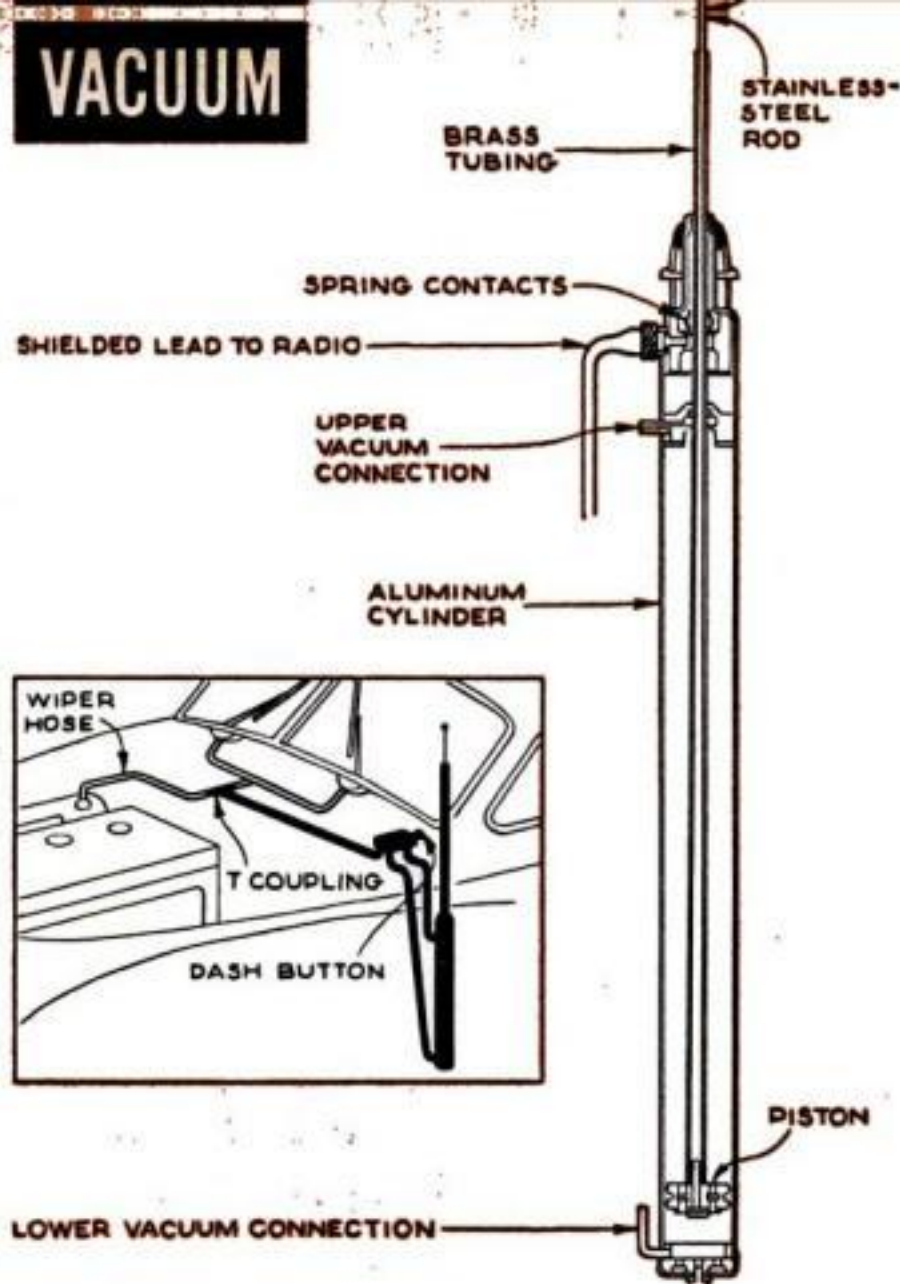
better by applying a light coat of lubricant. Petroleum jelly is excellent.

If you have an electric antenna, be careful never to hold the switch in operating position beyond the full travel of the mast sections, either up or down. Doing this will cause excessive wear of the drive mechanism. A bent mast may slow down or stall the motor. Should the antenna fail to operate, first check and tighten all electrical connections and check the fuse.

On vacuum antennas, it is possible for the hose to slip off the nipples on the control valve or cylinder. This is one of the first things to check if an antenna doesn't work.

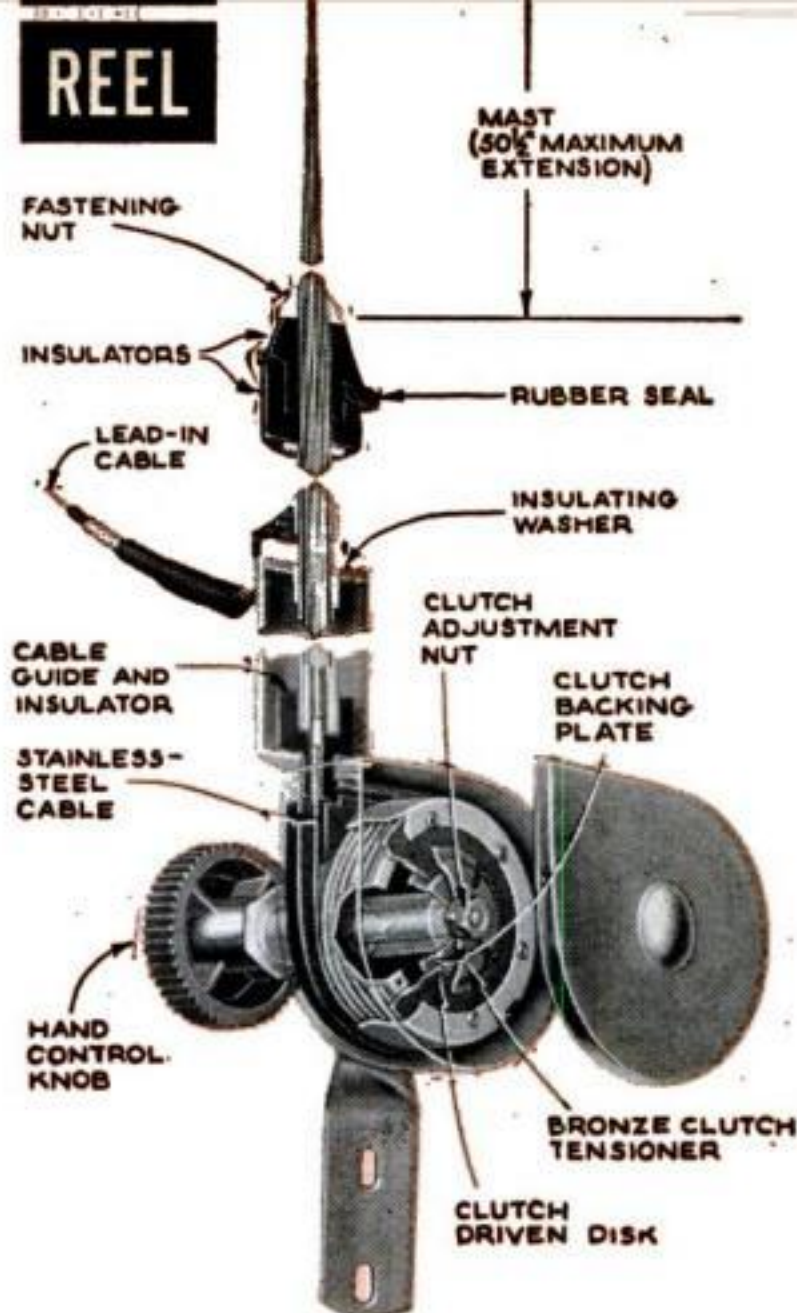
On reel-controlled antennas, it may be necessary to turn up the clutch adjustment nut occasionally. Unless there is good tension, the clutch will not drive the cable.

VACUUM



MANIFOLD VACUUM raises and lowers this antenna. Pushing in the dash valve opens the line to the top part of the antenna cylinder. This exhausts the cylinder, raising the piston and mast. Pulling out the dash control connects vacuum to bottom of cylinder—and the mast is pulled down. On some cars, pushing the control both turns on radio and raises antenna. Vacuum raises and lowers only the first section of mast, but the resulting drop of 27 inches is enough to clear most obstacles. Top sections of mast are raised and lowered by hand.

REEL



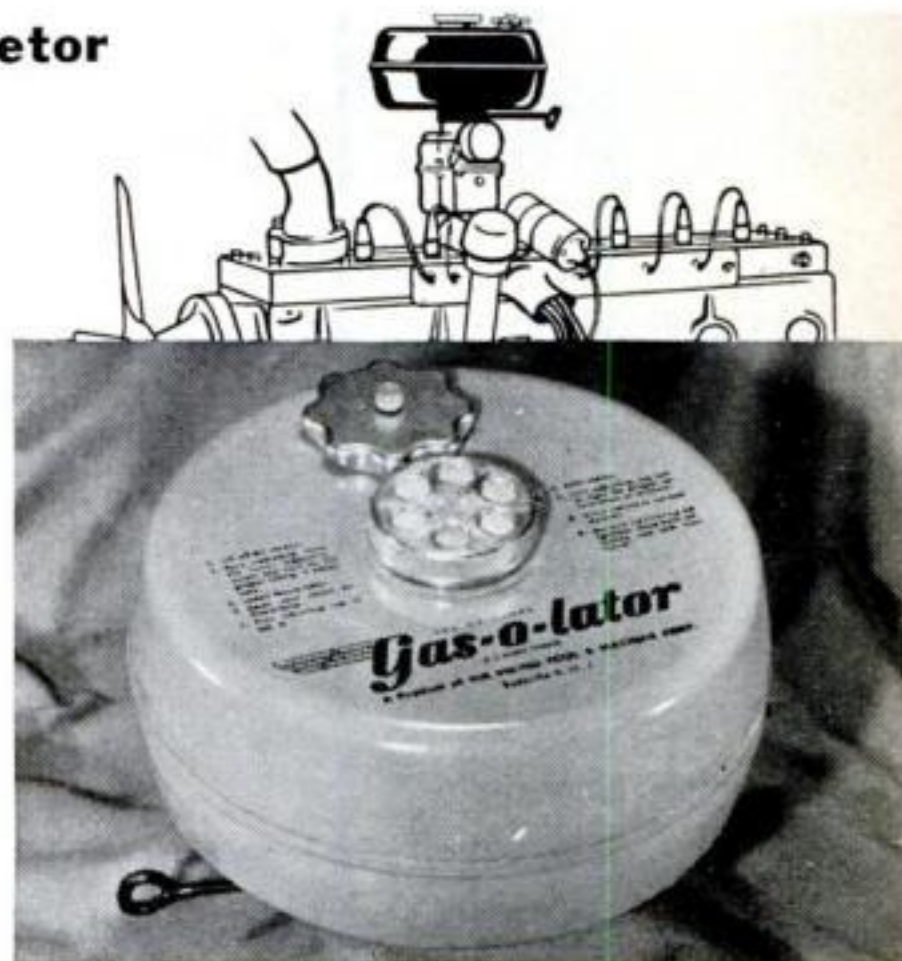
REEL-TYPE ANTENNA has been around for 10 years or more, but has recently been improved in several respects. The one shown here is a Studebaker-Philco unit. Turning a hand knob that projects into the driver's compartment raises and lowers three tubing sections and the solid tip of the mast. Close-fitting reel cover and a cable-guiding sleeve are designed to keep cable from kinking should the mast be forced down from outside car. If hand knob is turned beyond its normal limit, the clutch slips and no harm is done.

Emergency Fuel Can Fits Carburetor

INSTALLED in place of the air cleaner, this emergency fuel unit will get your car to a garage under its own power when lack of gas or fuel-system trouble stalls you on the road.

Containing a gallon of gasoline, the Gas-o-lator can be carried safely in a car. It is also used as a tow-truck accessory. Adapters will suit a single unit to the carburetor air horn of any car or truck.

After the unit has been clamped to the air horn, you turn on the gas with a protruding control. Revolving a cap on top adjusts the air flow to give the best fuel mixture. Both controls must be closed before the ignition is switched off. The Viking Tool & Machine Corp., Belleville, N.J., manufactures the unit.





PLASTIC-BODY SPORTS CAR weighs 1,050 pounds, 400 pounds less than Crosley station wagon from which it was built. With lowered chassis, car stands 31 inches high at cowl. Body kit contains brackets (left) to hold windshield. Instruments are mounted on center pedestal.

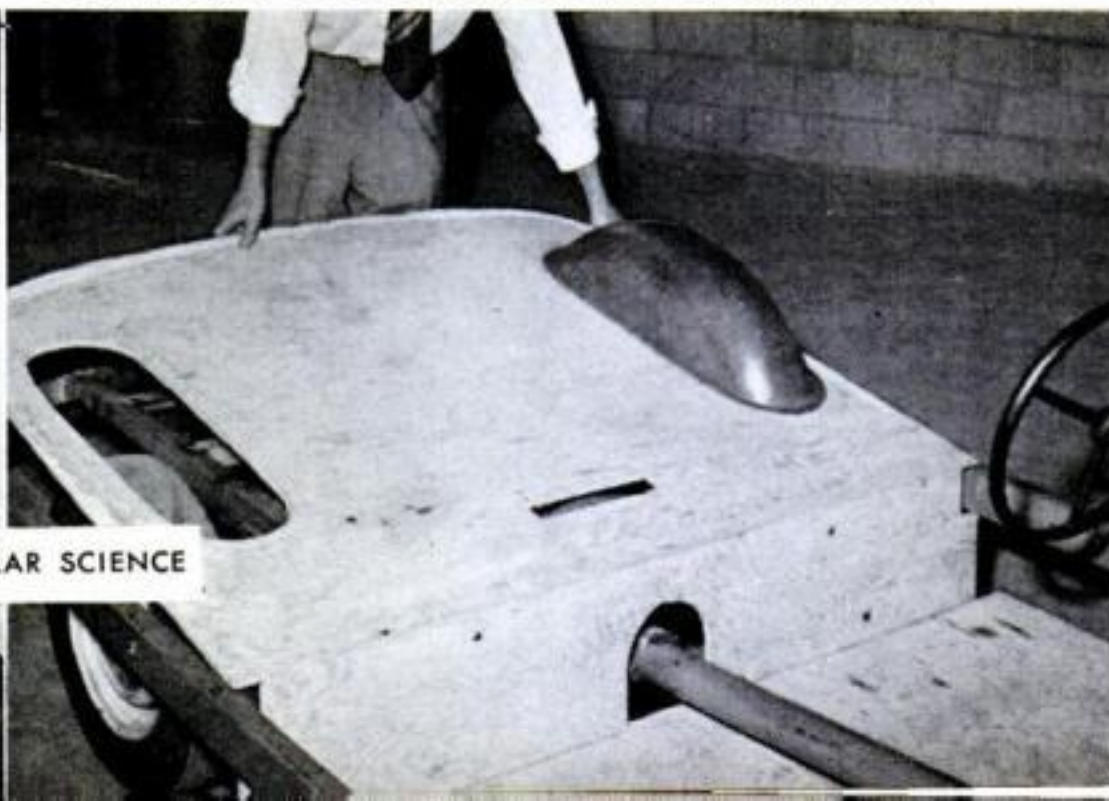
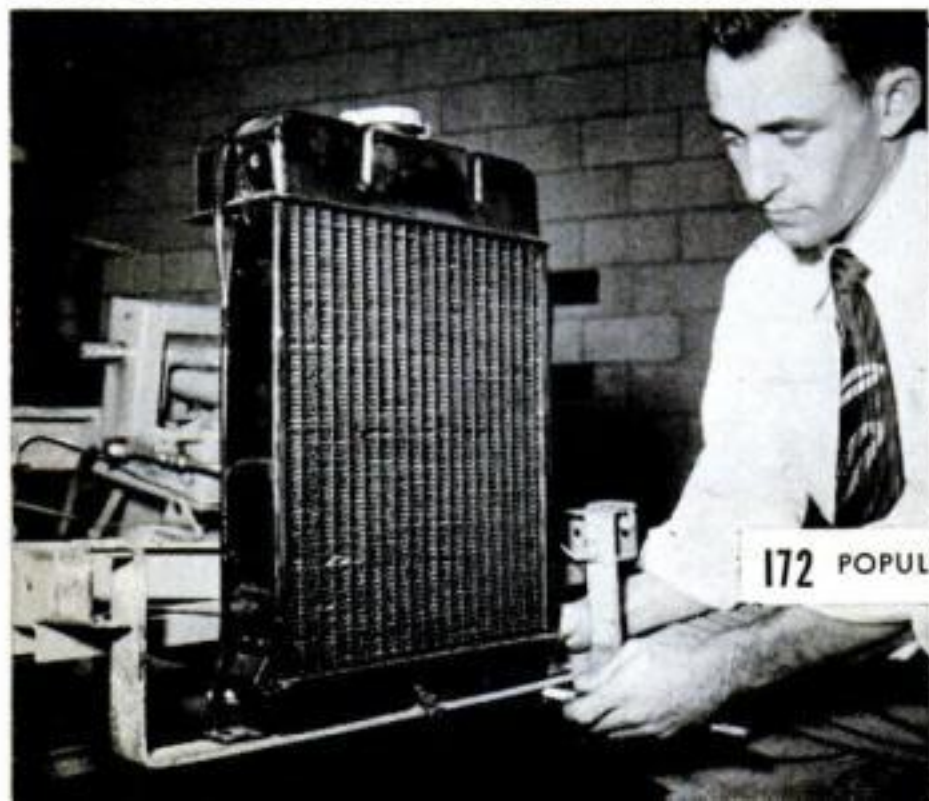


HOOD IS FITTED, as below, and all rough and protruding edges are smoothed before body kit is shipped to customer.



3 RADIATOR, lowered six inches, is bolted to strap-iron bracket welded to new body-support bracket. Engine, transmission and axles are left in their original positions.

4 PLYWOOD PANELS are installed as flooring. Molded-plastic wheel housings bolt to trunk-compartment floor. These come with body kit, as do instructions for cutting floor.



Come in Kit

Parts so light that one hand lifts them fit together to form a roadster that will make necks turn wherever you go.

SPORTS-CAR builders who laboriously hand-form their custom bodies from sheet metal now have an easier out. They can buy snappy bodies made of plastic-impregnated Fiberglas that weigh only 100 pounds each.

At present, the only body kit available is for a Crosley chassis. But the manufacturers, John Wills and Ralph Roberts of Pasadena, Calif., plan to bring out designs tailored to other cars if the first one makes a hit. And it apparently will. Already a number of their

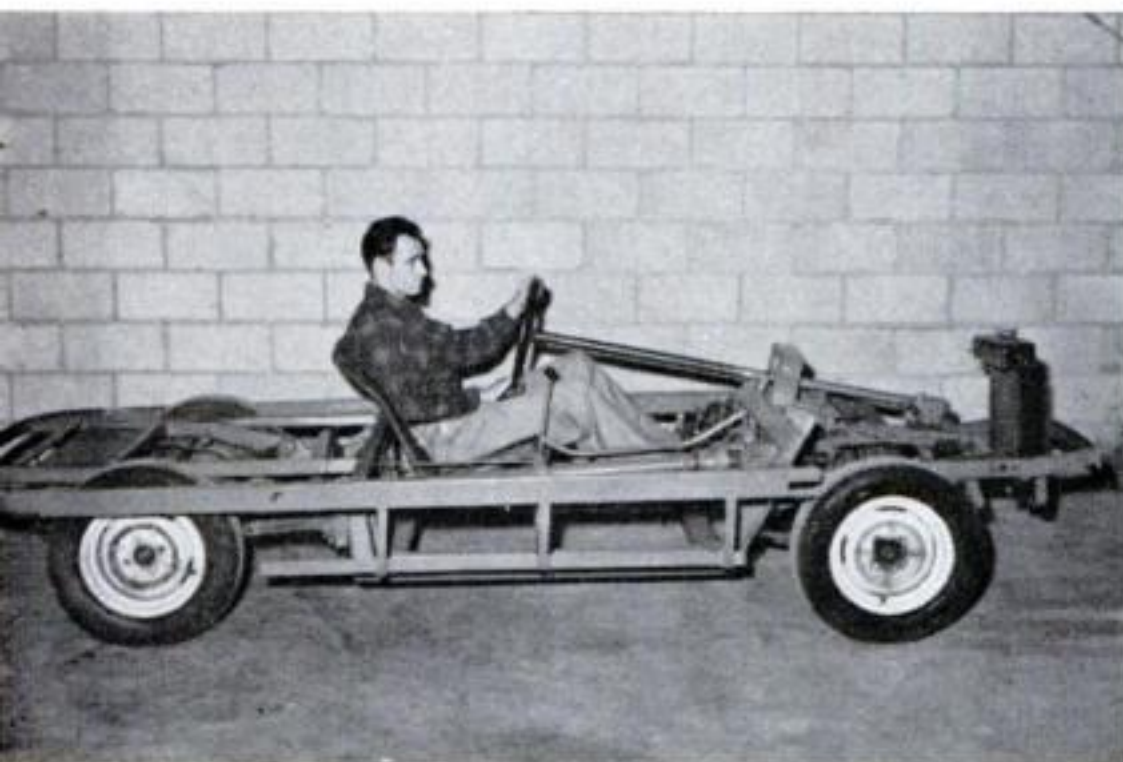
Skorpions are scooting around Southern California.

The partners figure a customer can have a handsome sports car for a shade under \$1,000. First, he buys a used Crosley. He also lays out \$445, plus tax, for the kit of plastic body parts. Then he removes the original Crosley body and changes the frame according to instructions in the kit. And shortly, the time depending on his ingenuity, he sports a sportster.

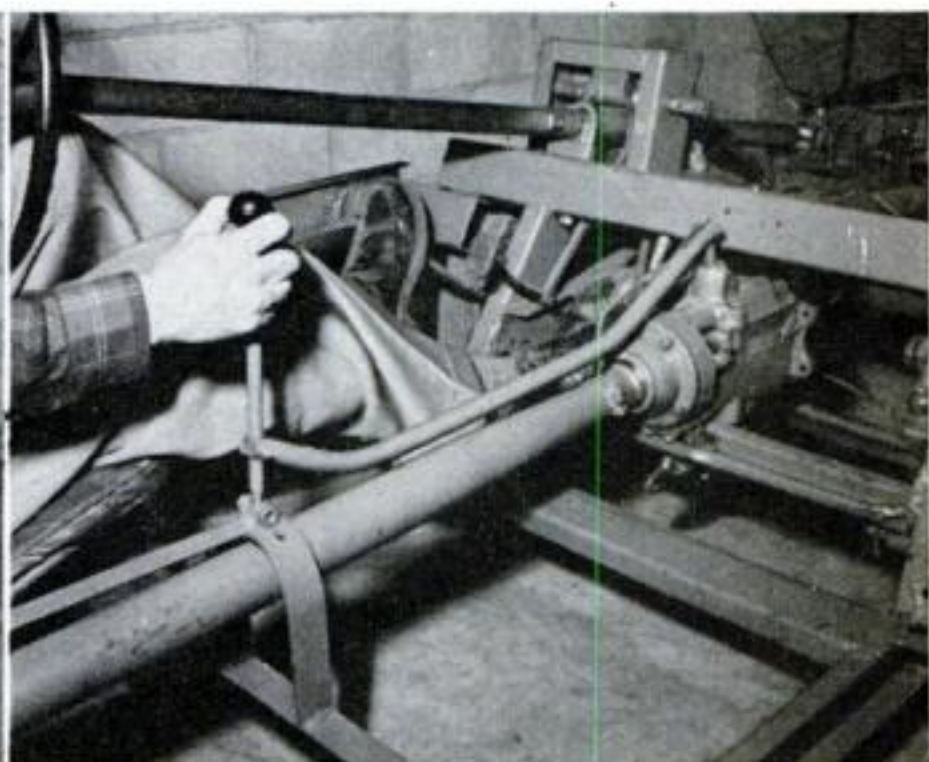
The kit includes four major parts—the main body, the hood, a wrap-around rear bumper section, and the deck lid. The material is so light that one person can easily handle any part.

Many popular accessories can be fitted to the car. If the plastic body is damaged in a collision, a repair kit soon makes it look like new.

END



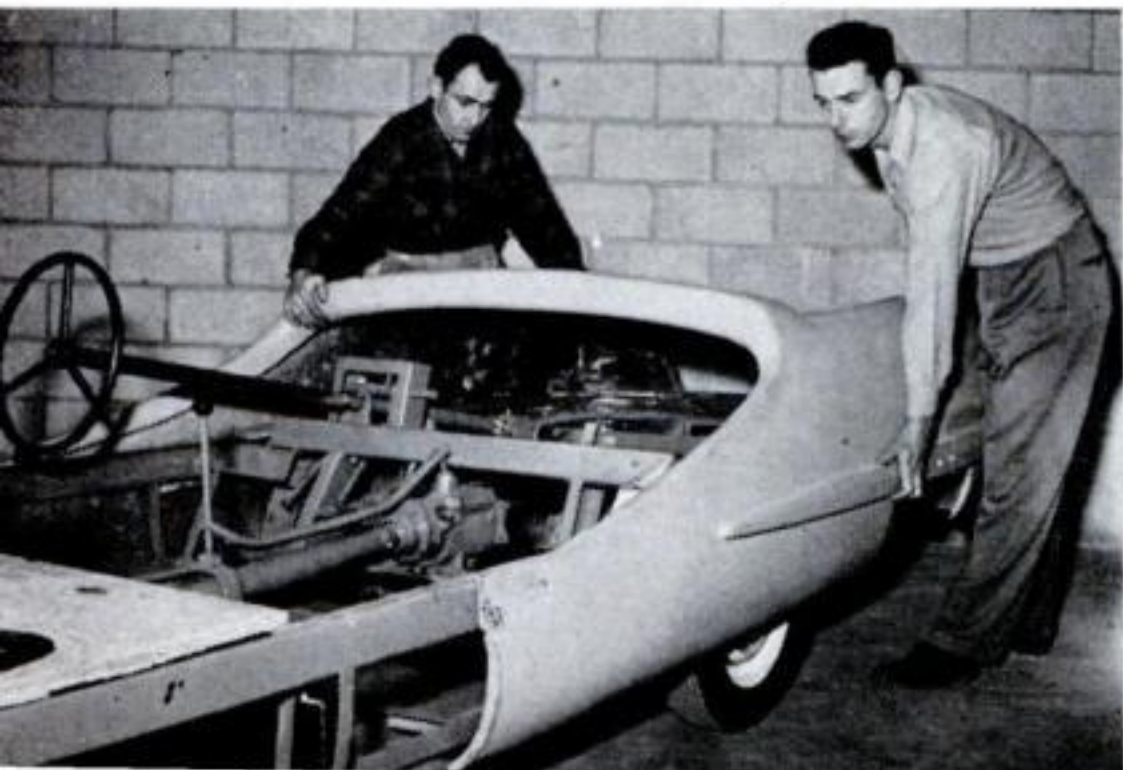
1 HOW CONVERSION IS MADE. Frame is lowered in cockpit section by welding basket-like framework between firewall and rear of seat. Main frame is cut out between these points. An outrigger frame is then added with side members outside wheels to support body.



2 SHIFT LEVER, moved back 18 inches, is mounted on ball joint and connects through tubular extension to transmission. Shift action remains the same. Steering column and pedals are pivoted down to suit lower seat. Floor is seven inches from ground.

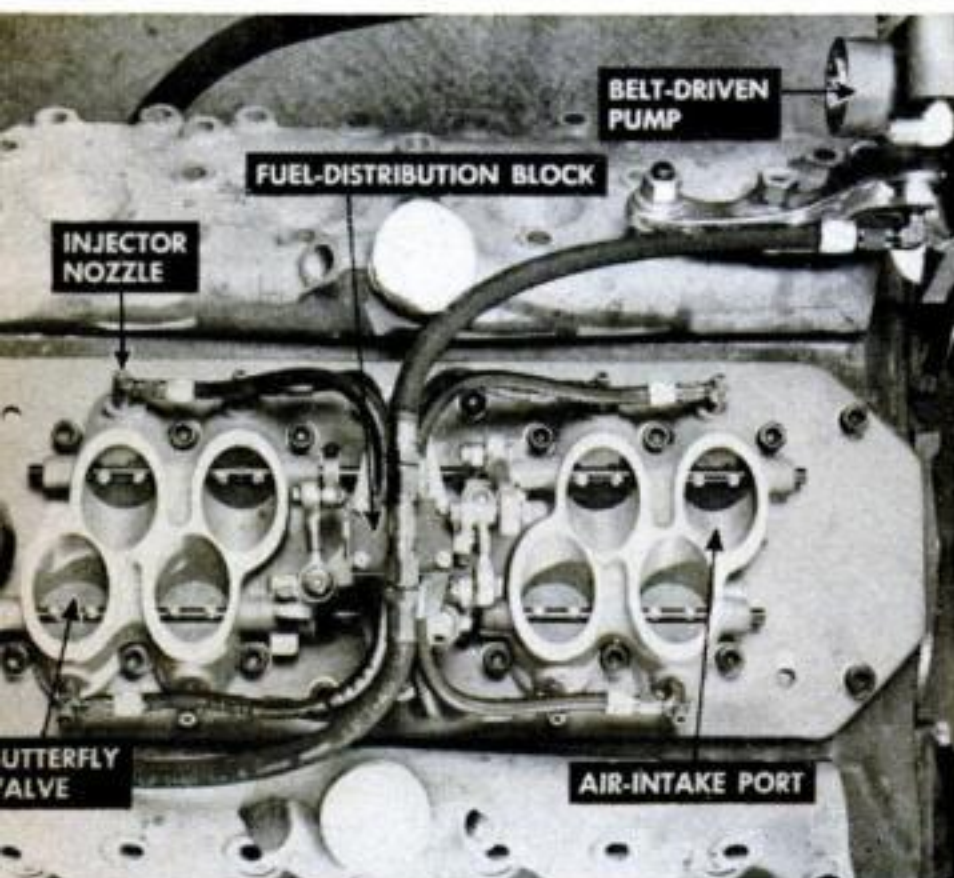
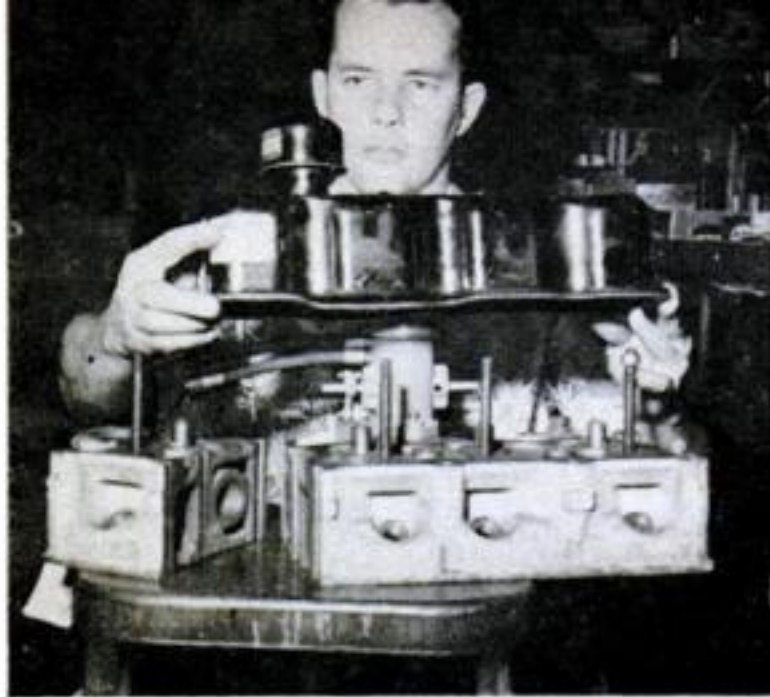
5 FRONT PART OF BODY slides into place. Then come rear skirt and bumper panel. Four bolts embedded in plastic attach body to frame. Installation takes only a few minutes.

6 DECK LID is attached to bulkhead behind seat with leaf hinges. A piano hinge supports the hood. The body comes primed and can be quickly painted any desired color.



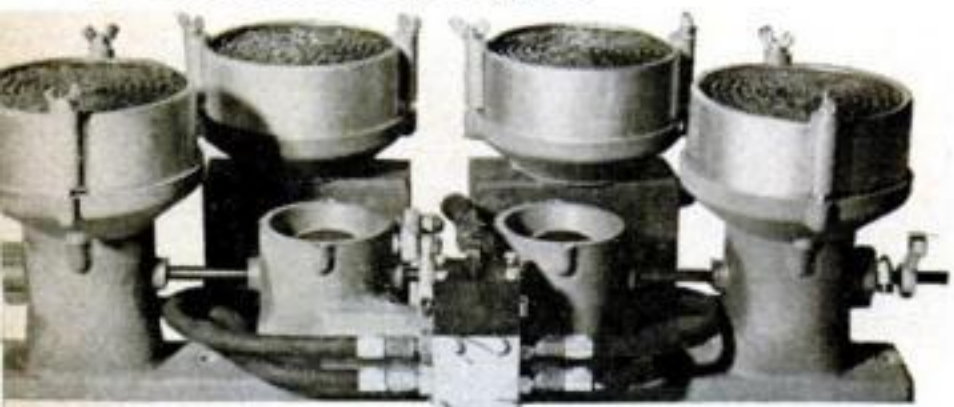
Cars Without Carburetors?

PASSENGER-CAR INJECTOR. Inventor Stuart Hilborn holds cover off test injector as he tries it for fit on a Willys F-head. The head was sawed in two for study of internal porting. Designed for gasoline, this injector was not complete when the photo was taken.



FORD V-8 RACING INJECTOR, seen from above, replaces conventional manifold and carburetor. Eccentric-vane pump forces fuel into distribution block, where a valve meters it equally to all cylinders. A nozzle sprays fuel into air entering each intake port. Butterflies control air flow. Through interconnected linkage, the accelerator varies fuel and air feed simultaneously.

FOUR-BARREL MODEL for an Offie engine has mesh air cleaners placed on intakes for dirt-track racing. Intake ports on base of assembly match those on engine.



Fuel-injection system now used by many racing drivers may give the family bus greater power and cut gas consumption.

HORSEPOWER boosts of 30 percent, coupled with fuel consumption that is almost halved, may be on the horizon for passenger cars. According to proponents of fuel-injection systems, these spectacular results may be possible if a special injector is substituted for the familiar carburetor.

Invented for racing. A constant-flow fuel injector, invented by Stuart Hilborn, has already proved itself on alcohol-fueled racing engines. Of the first seven cars to finish at Indianapolis last year, six had Hilborn injectors.

Now the young inventor is at work on a modified injector for use with gasoline in passenger cars. Preliminary tests indicate horsepower and economy gains equal to those obtained with the racing injectors. Adapting the injector is primarily a job of calibrating the metering system to gasoline and adjusting the unit to an engine of lower r.p.m.

How it works. The injector makes its gains by improving volumetric efficiency of the engine. Unlike a manifold, it has no winding passages of unequal length. Air travels the same distance to each cylinder through intake throats of uniform diameter throughout their length. Matched nozzles feed fuel in equal amounts into each air stream. An accelerator linkage varies air-controlling butterfly valves and fuel pressure simultaneously.

At present, Hilborn's firm, the Fuel Injection Engineering Co., Culver City, Calif., is manufacturing alcohol injectors for Offenhauser, Ford and Mercury V-8s, and certain specialized engines. Prices for Ford and Mercury injectors run around \$225 FOB Los Angeles.



Tip

TURN AND WATCH when you raise the top to be sure the framework doesn't catch anything that might tear the fabric or strain the bows. Release the control knob when the top is about 6" from the windshield posts and let it drop the rest of the way itself. Keeping the power on too long may knock framework out of line.



SLIP OUT FLAPS from under the side rails (if your car has them) before lowering the top. Buttons and attachments are supposed to release automatically as the top is pulled away, but don't bank on it. Do it by hand to be safe.



SPOTS ON TAN TOPS can often be removed by a little work with an art-gum eraser. Just rub the spot vigorously with the eraser.

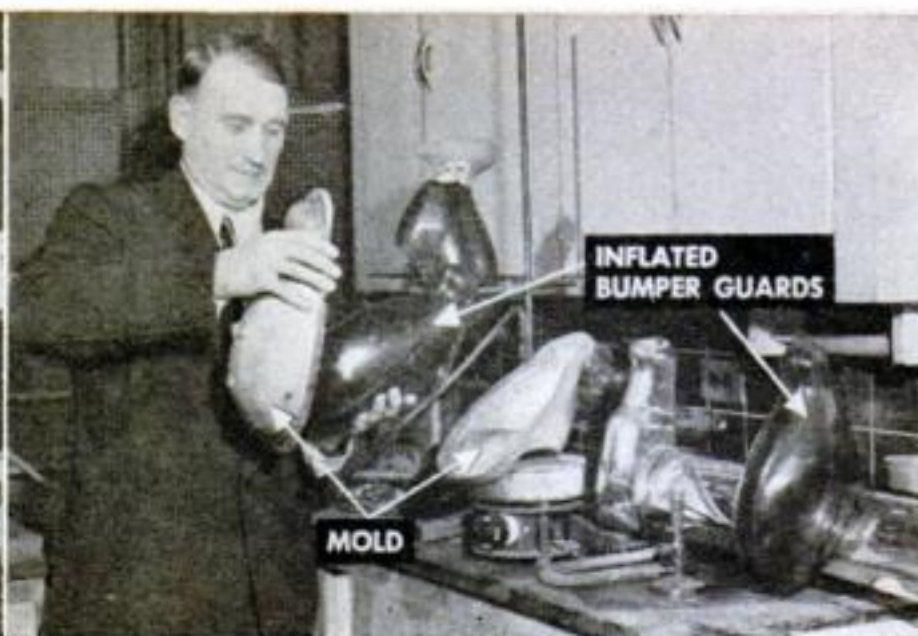
ALWAYS LOWER TOP SLOWLY, watching its progress carefully. If the framework has gotten out of line or if the pivots bind, rapid lowering can tear the pads or fabric.

USE WHISK BROOM occasionally to improve appearance of the top. Always use it before washing. Use a mild soap and rinse it off with hose. Let top dry in shade.



OPENING REAR CURTAIN is simplified if you unlock top at front to release tension. Zippers or snaps will then work more easily.

CLEAN PLASTIC WINDOWS by sponging with a soft, wet cloth. Do not rub dry; wipe off excess water with a clean, damp cloth. These suggestions are adapted from booklet put out by Atlas International, Chicago.



Rubber Bumper Bumpers Bounce Back Bumps

Now you can ease the bumps your bumpers get. New flexible guards molded (as shown at right above) from rubber or plastic give with the blow. Air trapped inside the

hollow guards absorbs the shock. The guards are clamped to the bumper bar by means of a steel plate on the back. *Hush Bumpers, Inc., Chicago.*

New Products for Your Car

Dirty "Pots" Cleaned in Place

SLUDGE and gummy deposits often restrict the narrow passages in carburetors ("pots" in hot-rod slang), causing poor engine performance. The treatment illustrated below is said to make it unnecessary to dismantle the carburetor for cleaning. A can of Gumout mixed with gas is attached to the carburetor, the fuel line is plugged, and the engine is run for a few minutes. *Pennsylvania Refining Co., Cleveland.*



Back Rest Keeps You Cooler



THIS lattice back rest lets air circulate behind you during hot-weather driving, keeping your clothing from sticking to the seat. Although designed for a car, it can also be used in a chair. *Frank Veale Mfg. Co., Columbus, Ind.*

New Sealer Stops Fuel Leaks

PLUGGING leaks in gas tanks is one of the many jobs intended for a new cement-like compound. Among the other uses claimed for Seal-All are: stopping leaks in radiator hoses and around windshields, repairing cracked distributor caps and battery cases, and waterproofing ignition systems. *Allen Products Corp., Detroit.*



Auto-Top Carrier

Loads at Side

EASY ACCESS is one of carrier's virtues. Side opening makes it unnecessary to scramble up the car when you want to get something out.



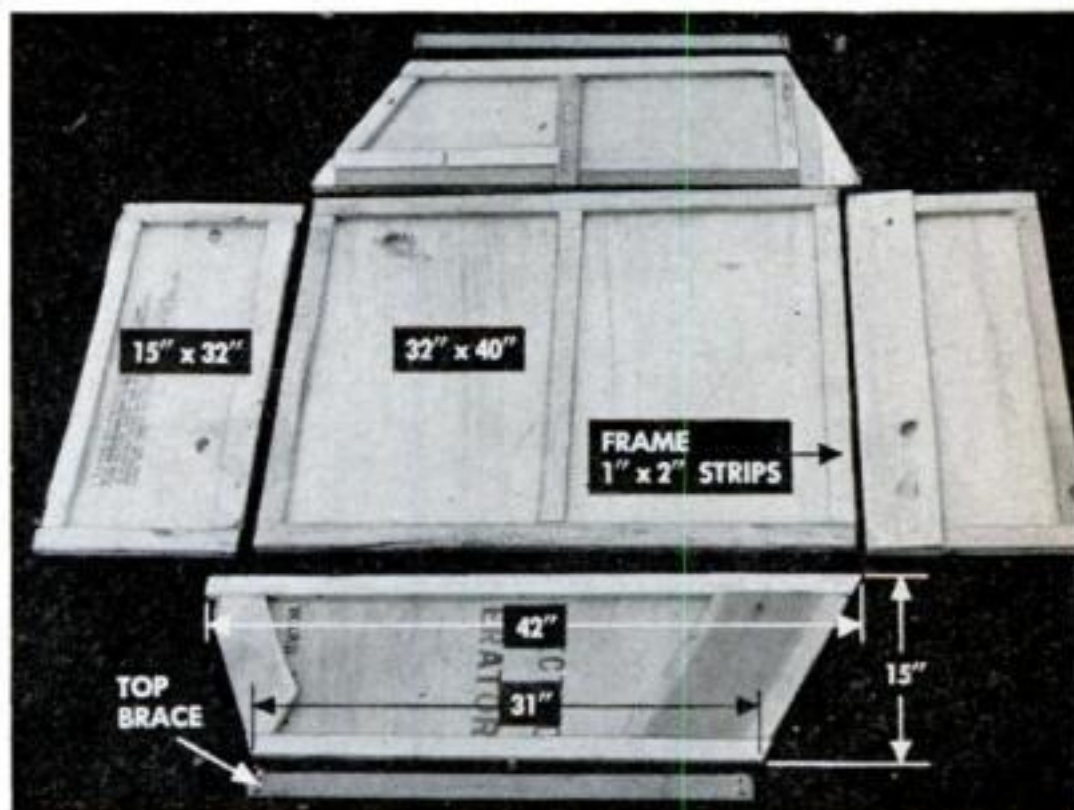
EXCESS vacation baggage won't be a problem if you put a carrier like this on the roof of your car. You can knock it together in a couple of hours. My son and I designed it with sloping ends to avoid a boxy look, and located a door on the side to make it easy to get at equipment carried inside.

Built of wood salvaged from a large packing crate, the carrier is bolted to two crossbars resting on vacuum cups. The crossbars, bought from an auto-supply store; a couple of hinges for the door; two screen-door hooks and a can of paint made up our entire expense.

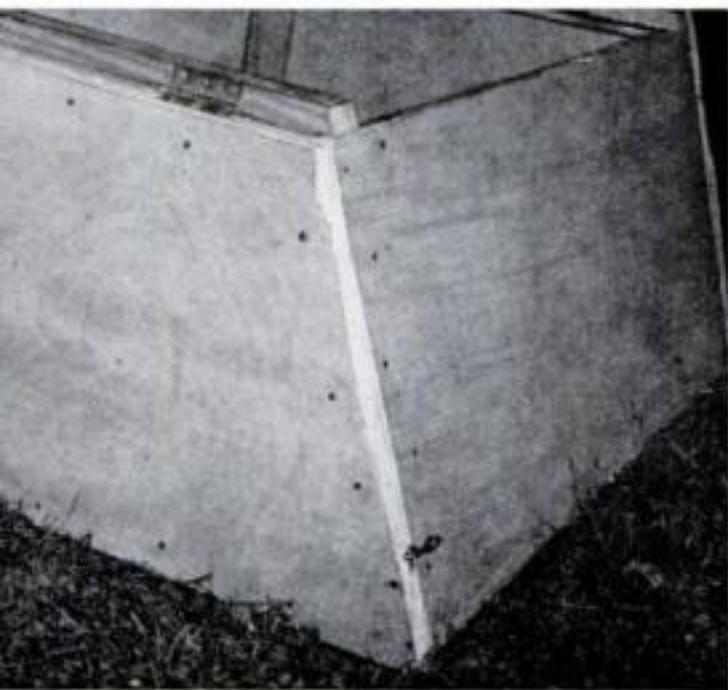
In our case, we wanted the carrier chiefly for carrying extra gas and oil, the spare tire and a few odds and ends. We estimated the size needed by laying plywood crating on the ground and arranging on it the objects to be carried.

The carrier was assembled with nails. Oilcloth scrounged from the kitchen table provided a weatherproof top. (The table

needed a new covering anyway.) Paint to match the car was applied to the finished box.—*Delos L. Glossner, Xenia, Ohio.*

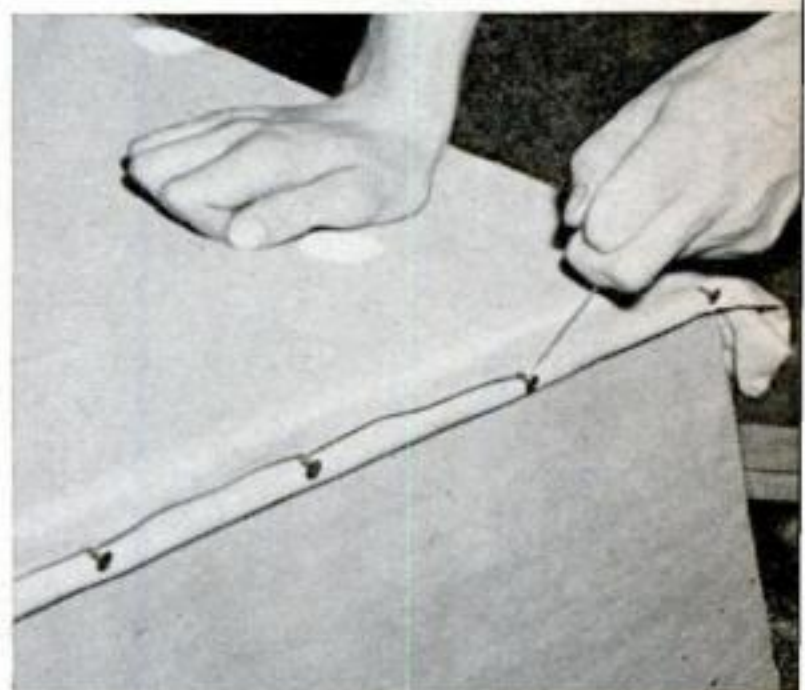


A REFRIGERATOR PACKING CRATE provided wood needed to build carrier. Parts look crude, but exterior paint after assembly concealed markings on wood. No top panel is needed.



A SCREEN-DOOR HOOK at each end keeps the door fastened. Two butt hinges are screwed to one of two braces across the top. Two triangular braces strengthen the door opening.

OILCLOTH was used to cover the top of the carrier. Edges were turned under and tacked to sides and ends. Copper wire held by roofing nails keeps wind from whipping cover off.



Gus Diagnoses



*"Whoa, Silas, not so fast.
What's the
youngster got to say?"*

RAY (X) 1967 -

the Flat-Tire Case

A mysterious epidemic of flats had turned that old nickel nurser, Silas Barnstable, into the Model Garage's best customer—for free air.



By Martin Bunn

GUS WILSON was feeling pretty happy. The first touch of spring was in the air and Gus was looking forward to all the things that warm weather brings—such as a chance to get in a little fishing now and then.

In this cheerful mood he chuckled good-naturedly at the sight of old Silas Barnstable, the town tightwad, helping himself industriously to the Model Garage's free air and water. Stan Hicks, Gus's helper, however, felt a little more strongly on the subject of Silas.

"Look at that old skinflint," he said disgustedly. "The only time he comes around here is when he can get something for free. Gas and oil he buys at the cut-rate joints. Air and water he gets here. Why, he even stops by and uses our liquid spray to clean his windshield."

"Oh, don't be so tough on the old boy," Gus commented. "Thrift is still supposed to be a virtue, isn't it?"

"Yeah, but you know what I caught the old penny pincher doing the other day? He was pawing through our junk box picking out old discarded bolts and things."

"So what? If he wants to rummage around to save a nickel or a dime, let him."

Gus Greets a Steady Customer

Gus slammed down the hood of Doc Marvin's car and strolled out by the gas pumps.

"Getting your tires up to pressure?" he asked the wry-faced, bespectacled little man crouched down beside his old sedan.

"Had a flat," replied Barnstable, who was as frugal with words as he was with money.

By this time, Barnstable was treating the tire in the trunk to a helping of Gus's free air. From the amount it took, Gus gathered that this was the tire that had gone flat and that, after repairing it, Barnstable had switched it with his spare.

Gus thought no more about Barnstable and his flat tire until the next morning. He was replacing a carburetor when he looked out through the open repair-shop doors. There was Barnstable putting air in his spare again.

Another Good Tire Goes Wrong

"Another flat?" Gus called.

"Yup," grunted Barnstable. "Can't understand it."

"You probably used a bum patch."

"Didn't patch it. Couldn't find any hole in the tube. Then this morning when I went out to look at the car I had another flat."

"Could be a bad tube. That's the trouble with used stuff."

"Now, none of your sarcasm, Gus Wilson. Besides, it wasn't the same tire. I put the one that went flat yesterday in the trunk as a spare. The one on this here wheel—" Silas poked the right rear wheel with his toe—"was flat this morning."

"Find a nail this time?"

"Nope. Same as yesterday. No nail, no cut, no nothin'. Just flat. So I switched it with the one in the trunk and drove over here to get some air."

Gus dipped his finger in the water can beside the gas pump and put a blob of water on the tip of the valve stem on the tire in the trunk.

"What you doin'?" Silas inquired suspiciously.

"Oh, just thought maybe you had a leaky valve, but it seems to be tight. No bubbles."

"Valve's all right. So's the tire." Barnstable waggled his finger at Gus. "I think I know what's goin' on. And I'm gonna find out."

The following morning, just as Gus drove up to the Model Garage, he saw old Barnstable's car pull out past the gas pumps and onto the road toward town. Immediately after, a large sedan drove up beside the first

pump. Gus recognized Paul Rodgers at the wheel. He was tight-lipped with anger.

"Fill 'er up," Rodgers said shortly. Then he nodded toward the road. "Wasn't that Barnstable's car that just pulled out of here?"

"I think it was," Gus admitted. "Why?" "What did he want?"

"Don't know, I wasn't here. Hey Stan! Come out here a minute."

Stan approached the car, wiping grease off his hands.

"What was ailing old Silas' car this morning?"

"Same thing. Needed air. Had a flat again this morning, and boy was he hopping mad. Said something about 'catching the culprit' tonight."

"Why, that miserable old tightwad," exploded Rodgers. "You know, he lives near us out on Rolling Road. Keeps his car parked outside his house day and night because he's too cheap to use his own garage—rents it to someone else. Well, last night he came over to our place and accused my boy Dick of deliberately letting the air out of his tires."

"Why did he pick on Dick?"

"I don't know. Probably because he's the only teenager on the block. Barnstable claims he saw Dick leaning up against his car the other evening. Said he was going to prefer charges if he kept having flat tires."

"Oh, he's probably just letting off steam," consoled Gus.

Early the next morning, Gus was wheeling his tow truck back to the Model Garage, after a rush call for a rental battery, when he suddenly realized he was on Rolling Road. As he was wondering how old Silas and his epidemic of flat tires were getting along, he suddenly spied Silas himself holding young Rodgers by the nape of the neck.

"Hey, what the dickens is going on?" Gus called, braking the tow truck to a stop. As he got out he saw that Silas' car had another flat on the right rear tire.

"I caught him! I caught him!" Barnstable was shouting triumphantly. "He's the one who's been letting the air out of my tires. The police will take care of this."

"Whoa, Silas, not so fast. What's the

youngster got to say?" protested Gus.

"Honest, Mr. Wilson, I didn't do it," young Rodgers pleaded. "I was on my way to school and I dropped my baseball. It rolled under Mr. Barnstable's car so I reached down to pick it up. Next thing I knew he grabbed me."

Silas reluctantly loosened his hold on the youngster. "Tires don't just go flat of their own accord," he grumbled. "Somebody must be letting the air out of 'em."

"Not me," said Dick, with a little quaver in his voice. "And that's the truth."

"I believe you, Dick," Gus said. "But you better run along to school now." He turned to Silas. "Tell you what I'm gonna do." He grinned. "I'll put your spare on for you and you follow me back to the garage. If I can't find out what's causing your tire trouble you can call in the cops."

"Well, I ain't gonna pay for the work. Just remember that this is all your idea."

Back at the Model Garage, Gus lifted the flat tire out of the trunk and began inspecting it. No nails or cuts showed on the outside of the casing so he took it off the rim and examined the tube. Old Silas was right on one point at least—there wasn't a hole or a tear in it. Even a complete dunking in water failed to show any telltale bubbles.

Gus sighed and scratched his head.

"See, what did I tell you?" Barnstable chortled.

Gus said nothing. He dried the tube off, put it back in the casing and got the tire back on the rim.

"It's that young Rodgers rascal," Silas persisted.

"Could be, but I still doubt it. By the way, where's the valve cap for this tire?"

"Don't use none on that one. No dust in there. Valve caps cost money."

Gus shook his head in bewilderment. Just how miserly could a guy get?

"Satisfied?" snapped Barnstable.

"Not yet," Gus replied calmly. "Now let's go over this flat-tire business again. First of all, every flat has been on the right rear."

Silas nodded.

"Second, only two tires have been in-

No Choking Matter

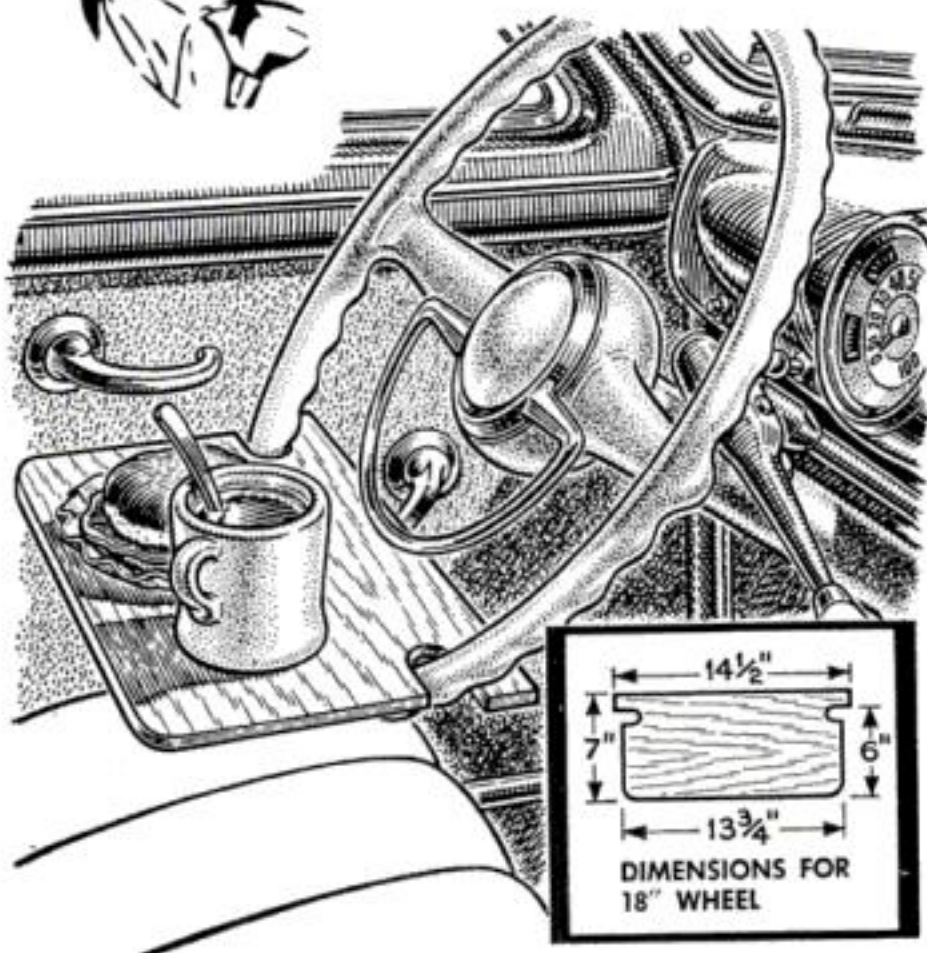


A LADY in the Midwest complained to a gas-station attendant that she wasn't getting very good mileage. He noticed that her hand choke was out and asked why.

"Oh, I always leave it that way," she said. "It makes such a convenient hook to hang my purse on."



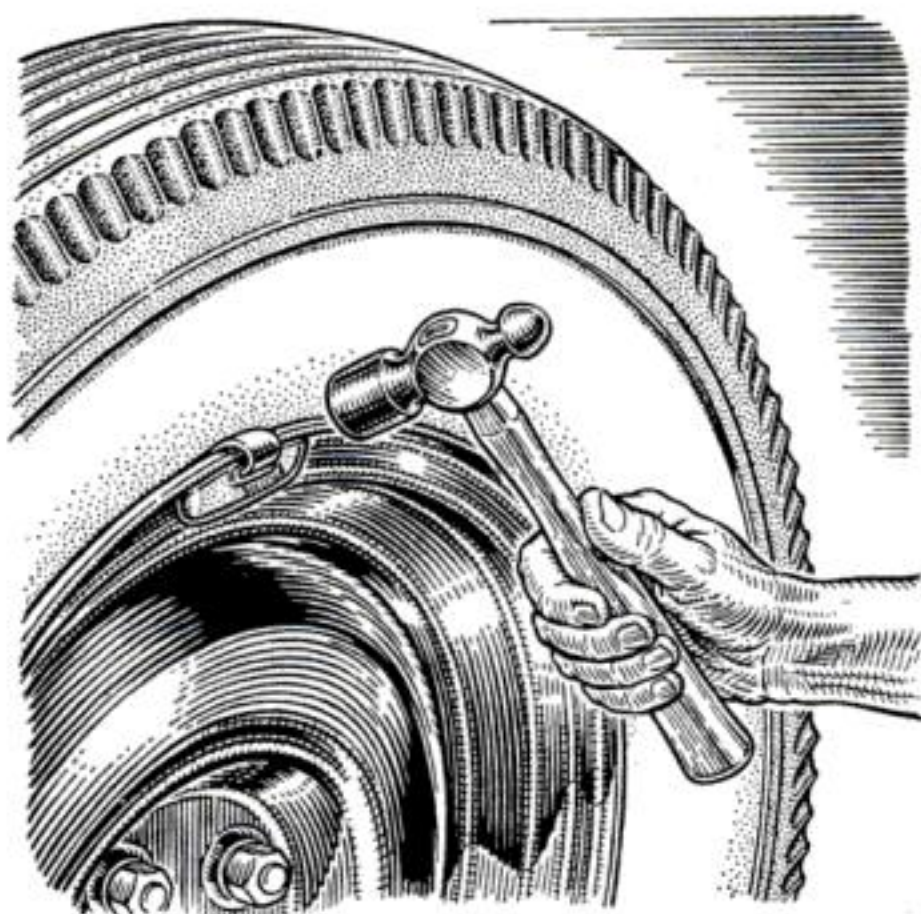
Hints from the Model Garage



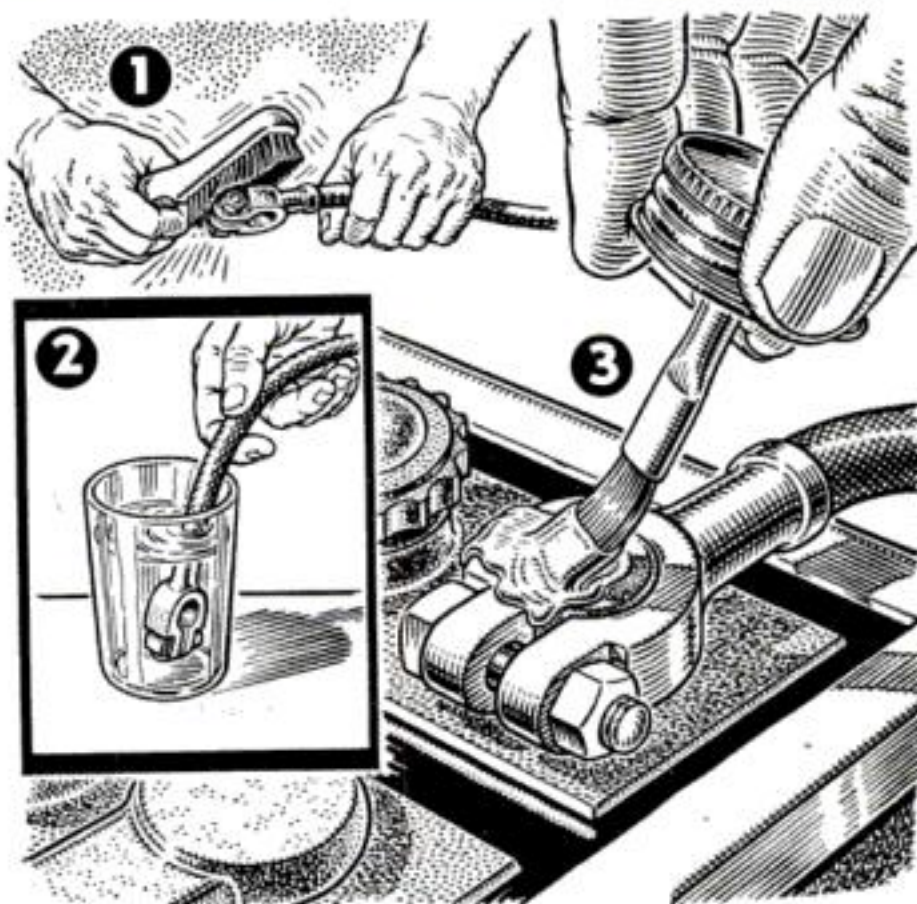
Lunch at the Wheel. For picnicking or eating at a drive-in, a tray like this will often be handy. Gravity and the protruding ears lock it to the wheel. For the other side of the car, the lowered glove-compartment lid makes a useful shelf.



Inner Tube Quiets Jack. A bumper jack won't rattle so much in the trunk if you store it this way. Raise the jack a few notches against an inner-tube rubber band. Cut a sleeve from a bicycle inner tube, pull it on the shaft, and slip in handle.



Seat Wheel Weights Carefully. When balancing a wheel, hold the weight in the correct position and give it one or two taps with a light hammer. Hitting too hard may crack the weight or tab. Centrifugal force at high speeds then will loosen it.

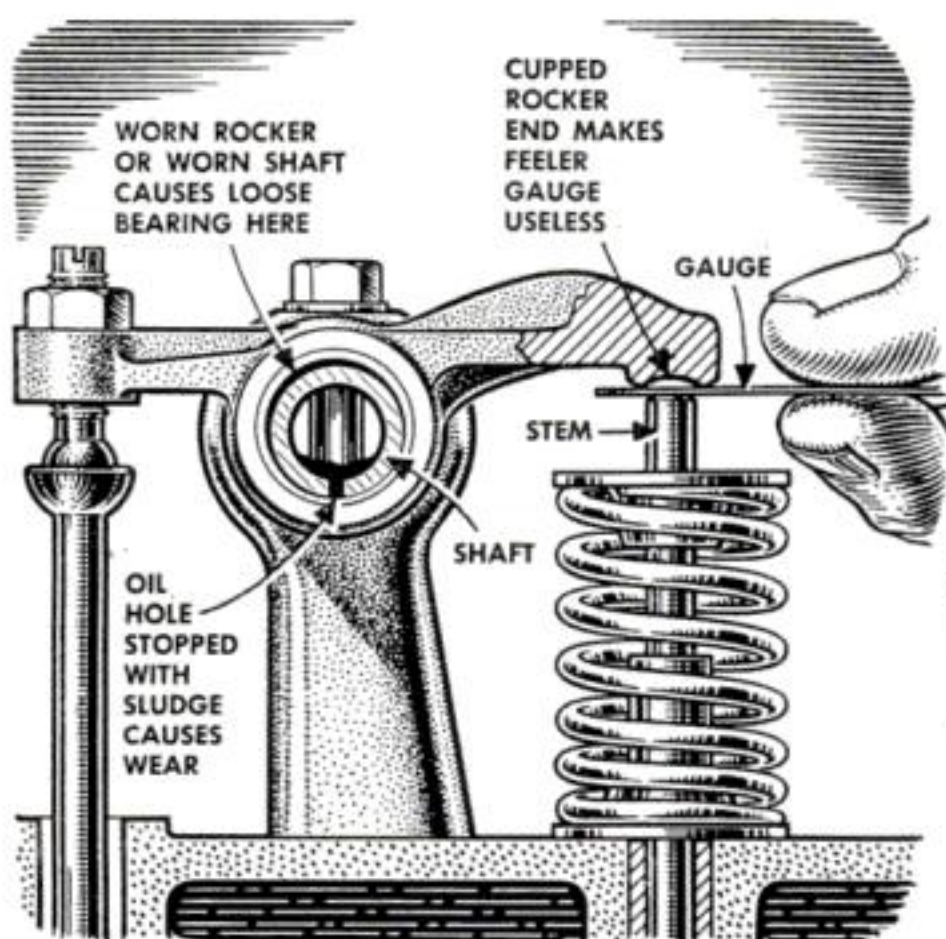


Rubber Cement Saves Battery. Irving J. Covert, Tarpon Springs, Fla., suggests this way to stop corrosion: wire-brush the clamps and terminals, dip them into or wipe on a baking-soda solution, and finally coat the terminal well with rubber cement.

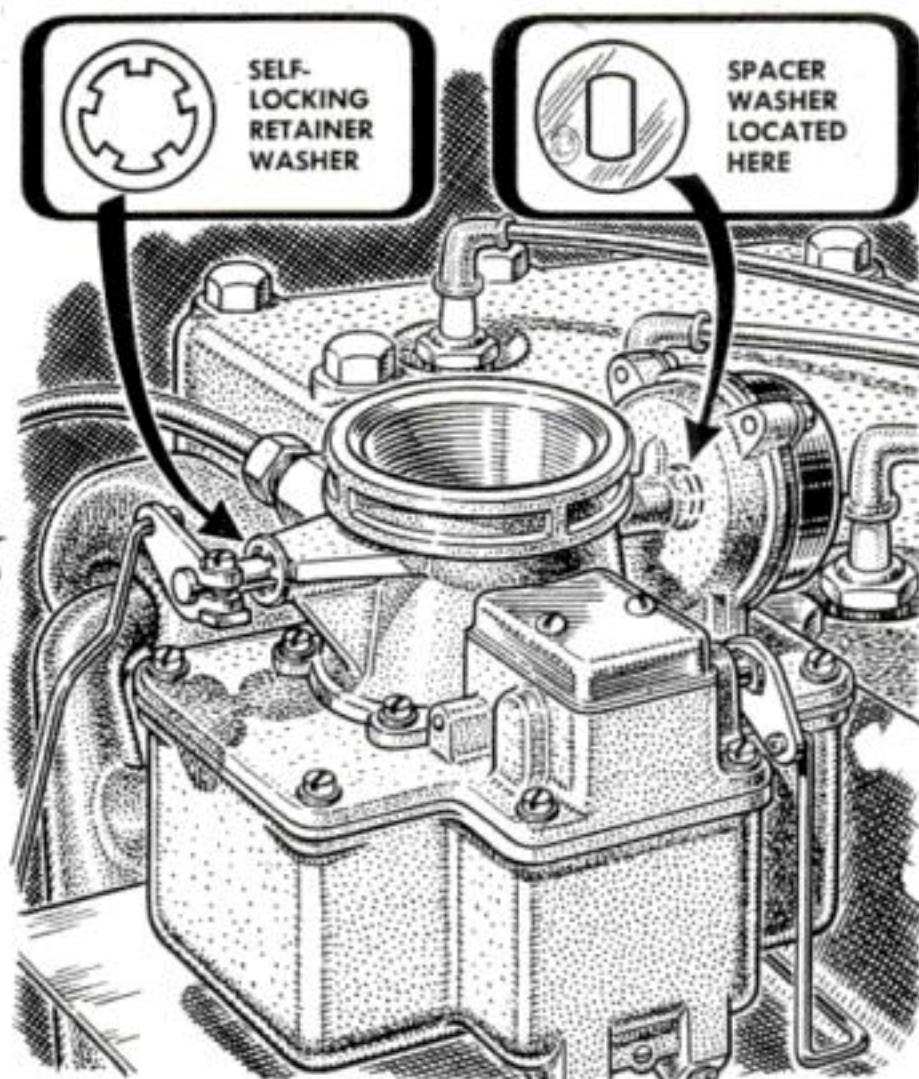
Please turn the page for more auto hints.

MAY 1952 181

MORE Hints from the Model Garage



Things to look for in overcoming rough idle, noise or poor performance in an overhead-valve engine are suggested here. An oil-feed line plugged with sludge may cause wear of the rocker-arm bushing and shaft. Severe wear prevents accurate valve timing and proper clearances. The rocker-tip contact surface must be flat.



A buzzing carburetor can sometimes be traced to a vibrating choke valve. In the type of carburetor shown (with a spacer washer on the choke shaft), the noise can usually be stopped by seating the retainer washer tight against the air horn, but without causing binding. The lock washer must be placed with its prongs inclined outward.



Gauntlet work gloves stored in the car will keep dirt from your hands and sleeves when you must make roadside repairs in your Sunday clothes. Be sure to get the kind that is long enough to reach beyond your wrist and cover your sleeves.



A long flexible extension on the spout of your oilcan will enable you to squirt oil into tight spots where the can itself wouldn't go. A length of model-airplane fuel line (neoprene) is just the right size and the oil won't damage it.

Spreader Sifts Lawn Fertilizer

This homemade garden tool spreads out an even, controlled swath as you stroll.

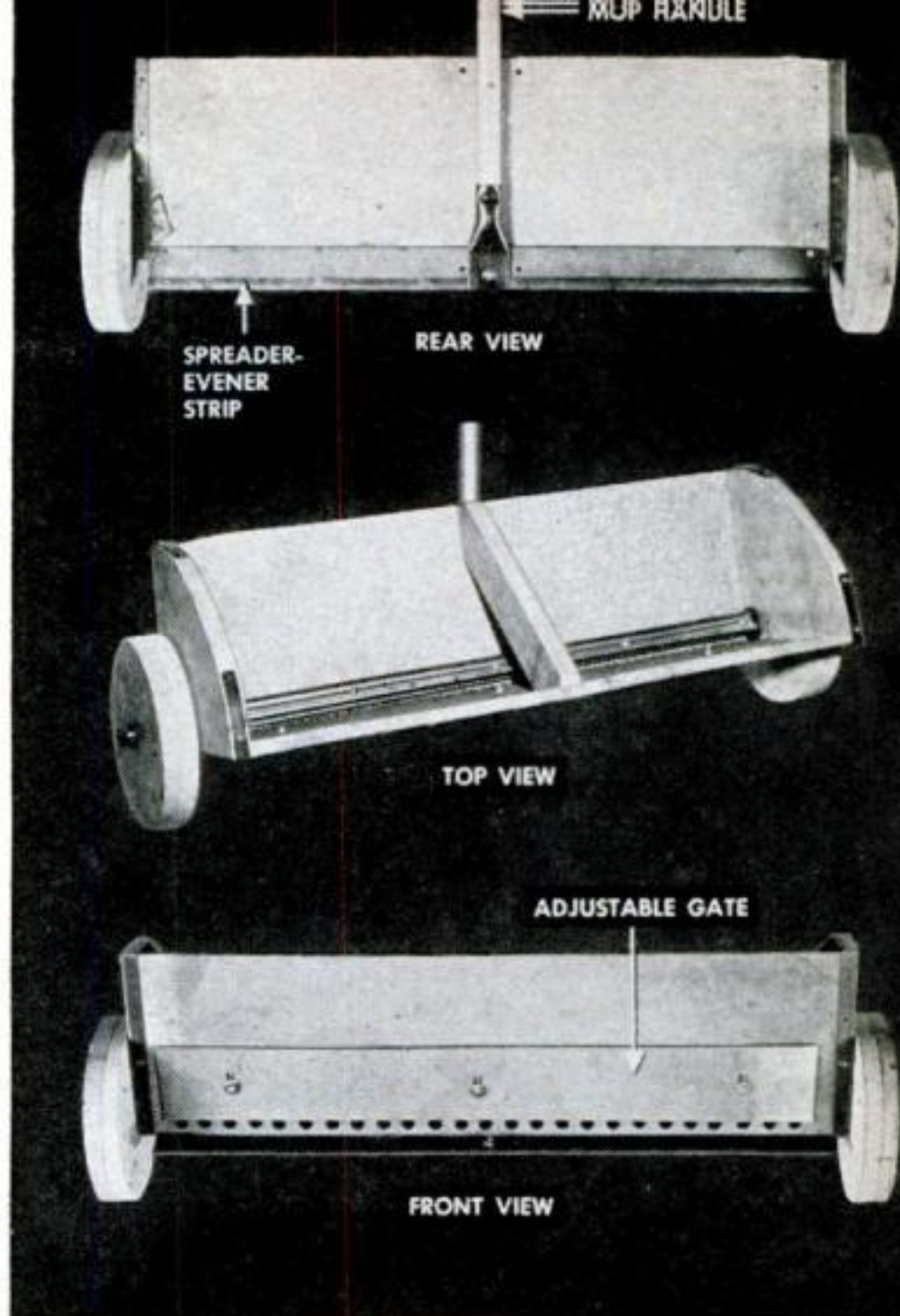


SPREADING fertilizer over your lawn is a walkaway with this easily made plant feeder. Just roll it over the ground and the job is done.

Wider than standard commercial models, this spreader covers more area in less time. It is made of scraps of wood and metal that should cost next to nothing.

Hopper. Cut out a 15½" by 25¼" sheet of galvanized or black

iron. Make the three right-angle bends shown by clamping the metal between wooden blocks and hammering it over with a mallet. Near the bottom of the V, drill a row of ½" holes spaced ⅞" center to center.

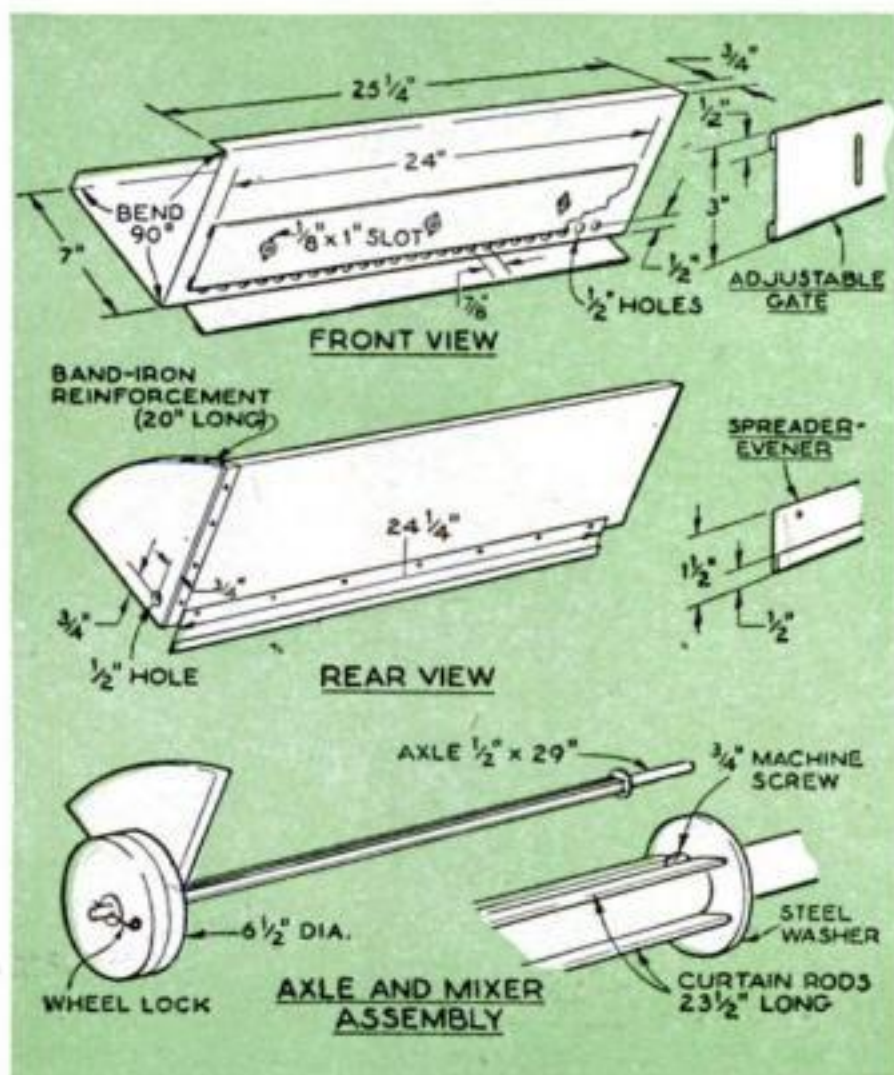


iron. Make the three right-angle bends shown by clamping the metal between wooden blocks and hammering it over with a mallet. Near the bottom of the V, drill a row of ½" holes spaced ⅞" center to center.

Axle. Use ½" rod about 29" long—it can be a trifle more or less depending on wheel thickness. Bolt two strips of flat curtain rod to it. Assemble wheels and washers as shown. Drill the axle ends, slip wire loops through the holes, and screw the loops to the wheels. Locking wheels and axle together causes the curtain-rod agitator to turn with the wheels. Stiffen both ends of the hopper with band-iron strips.

Gate. Bend the edges of the adjustable-gate strip double for stiffness. Cut three slots in the strip and bolt it above the sifter holes so it can be raised or lowered to regulate the flow. Double one edge of the evener strip and screw it to the back of the trough so it extends past the bottom of the V. Fertilizer pouring through the sifter holes should fall onto this strip and roll off in an even stream.

Bolt a mop handle to the box, brace and evener strip. Use rustproof bolts so that you can remove the handle easily when you want to store the spreader.—Glenn A. Wagner, Delmar, N.Y.



How You Can Use CHALKBOARD PAINTS



"YOUR kids are scribbling all over the walls in that back room," a visitor at my home told me. He shook his head. "Looks like a new paint job on those walls, too."

"It is," I said. "I just repainted that room last week."

"Don't you care?"

"No. That's why I repainted the walls. So the kids could mark on them. Keeps 'em busy."

What I had done, I explained, was to use one of the new chalkboard paints. They are designed to be marked on with chalk—like a blackboard. And you can erase the chalk marks on them just as easily as you can erase on a slate blackboard.

Any smooth surface that will take ordinary paint can be turned into a chalkboard. The photos show you some of the

Making a Framed Chalkboard



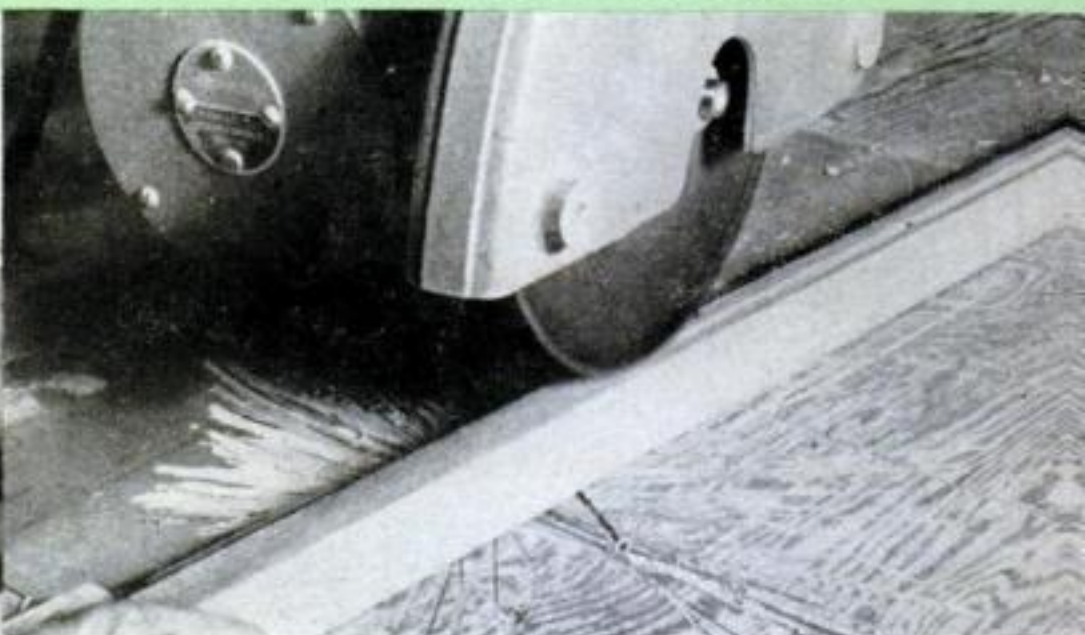
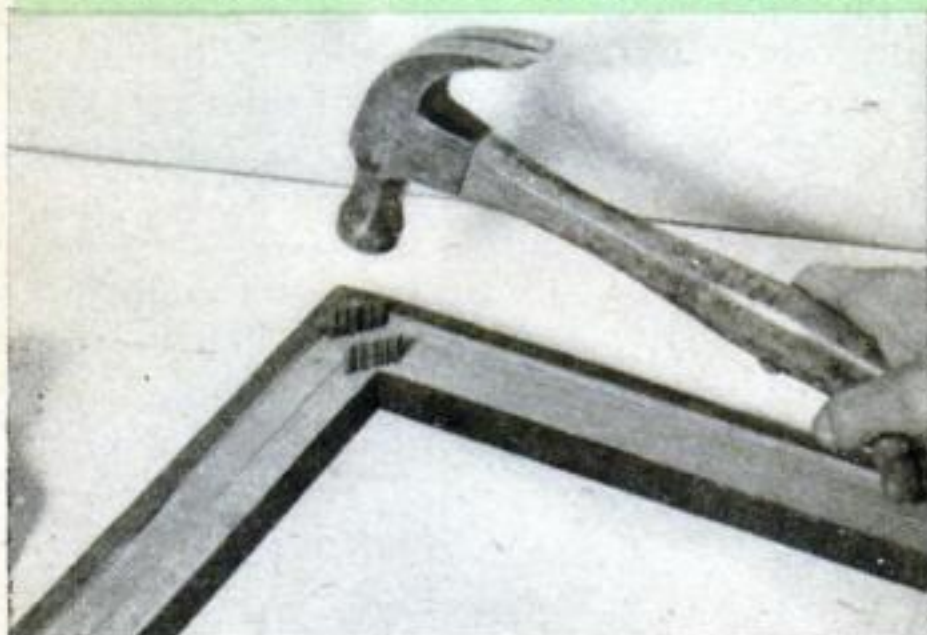
1 STIR THOROUGHLY. Since chalkboard paint contains fine grit that bites chalk to make sharp line, mixing is important.



2 APPLYING PAINT. Put thin first coat on composition-board panel. Let dry overnight, sand, and brush on second coat.

4 FRAME. For a big panel, use 1 1/4" by 2" stock rabbeted to take composition board. Join corners with glue, fasteners.

5 CHALK TRAY. Groove inner edge of bottom framing member. Here it is done with radial saw set slightly askew to line of pass.



uses I found for the paint. You'll probably think of others. For instance: if milk delivered to your home is left in a box, paint the lid and you can write orders to the milkman on it. Wind can't blow the messages away and it's easy to change them daily.

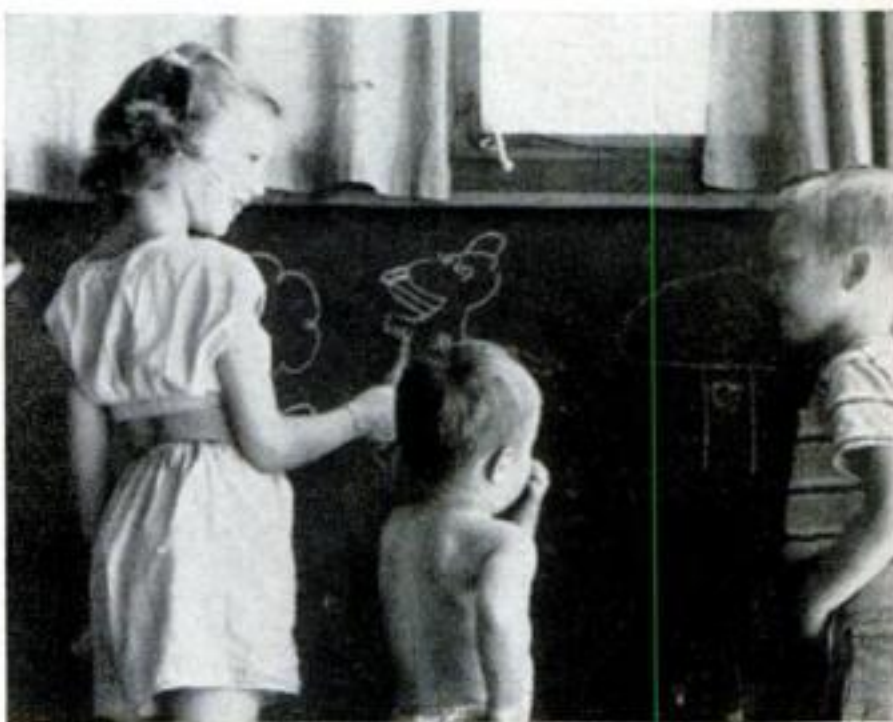
On most surfaces, you can get by with one coat. But for a really good writing surface that will wear for a long time, I've found a second coat is necessary. On exceptionally porous materials—like some composition boards—you'll need three coats. You can substitute a primer for the first coat.

Chalkboard paints are available in black or green, and they can be brushed or sprayed just as ordinary paints are. The greens—the shades vary from one maker to another—are attractive as wall paints, too.—*Darrell Huff, Sonoma, Calif.*

More Chalkboard Ideas



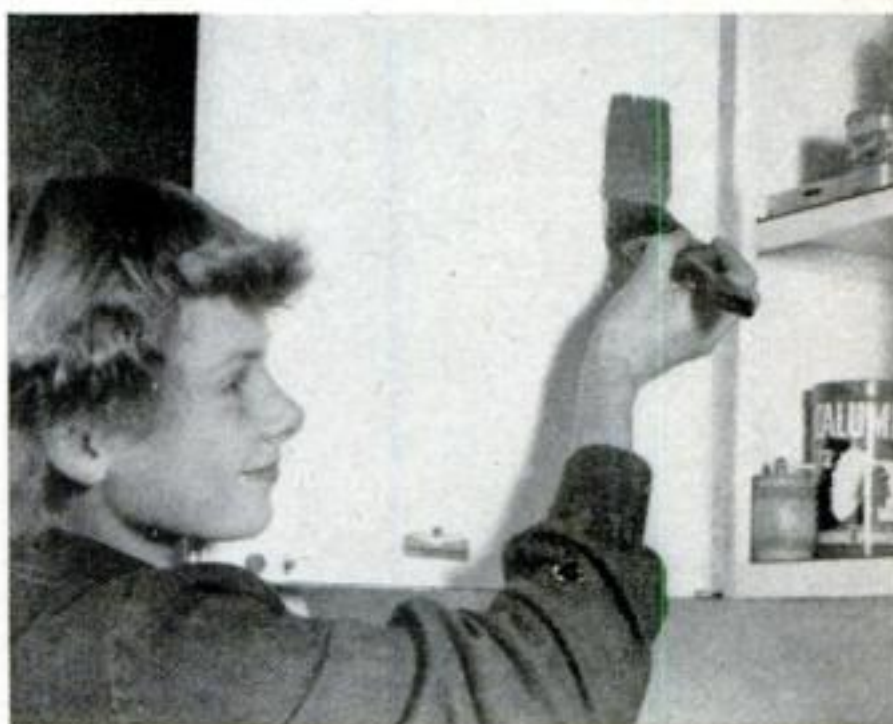
MESSAGE CENTER. Hang a piece of chalk-painted plywood or wallboard near the telephone for messages, or just paint a section of the wall.



CHALKBOARD WALLS. Delight youngsters by turning entire wall of their room into a big chalkboard. Green is attractive, too.

3 SANDPAPER. When final coat is dry, wet-sand the surface with aluminum oxide paper made for wet sanding.

6 HANGING THE BOARD. Six screws will handle a 4' by 8' job on wood wall. For this concrete wall, toggle bolts were used.

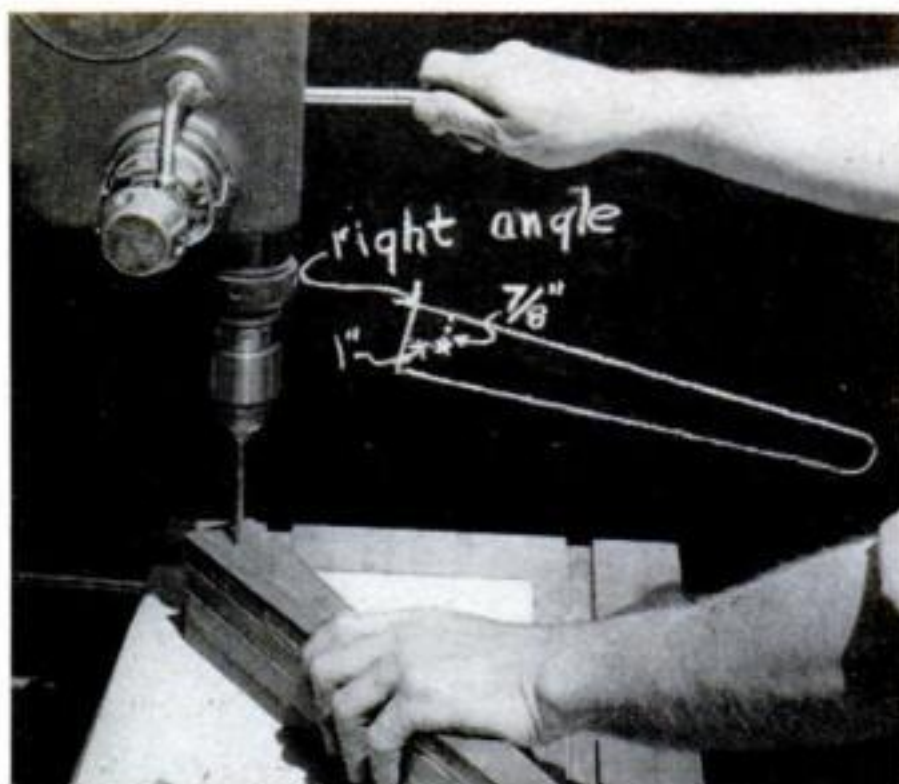


KITCHEN MEMO BOARD. Inside of steel cabinet door is ideal spot. Board can be used for market lists and chore assignments.

[Continued on next page]



DOOR CHALKBOARD. In your absence, callers can find your messages or leave their own. You can also leave notes for deliverymen.



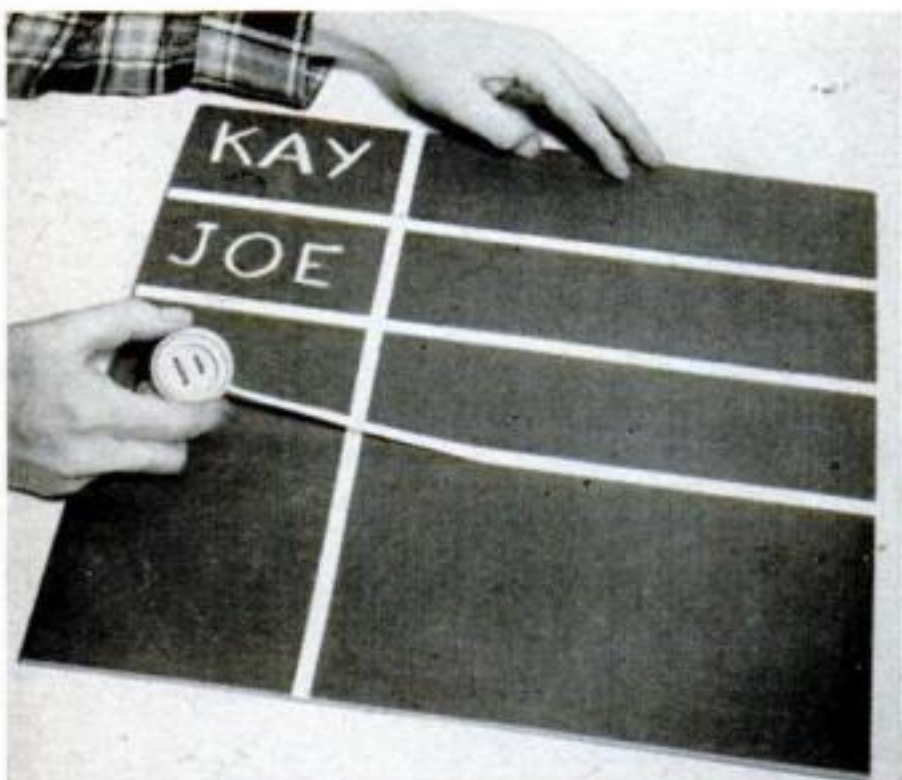
WORKSHOP USES. Chalk walls do many jobs in a shop. This one is used for sketching plans and drawings and for posting reminders.



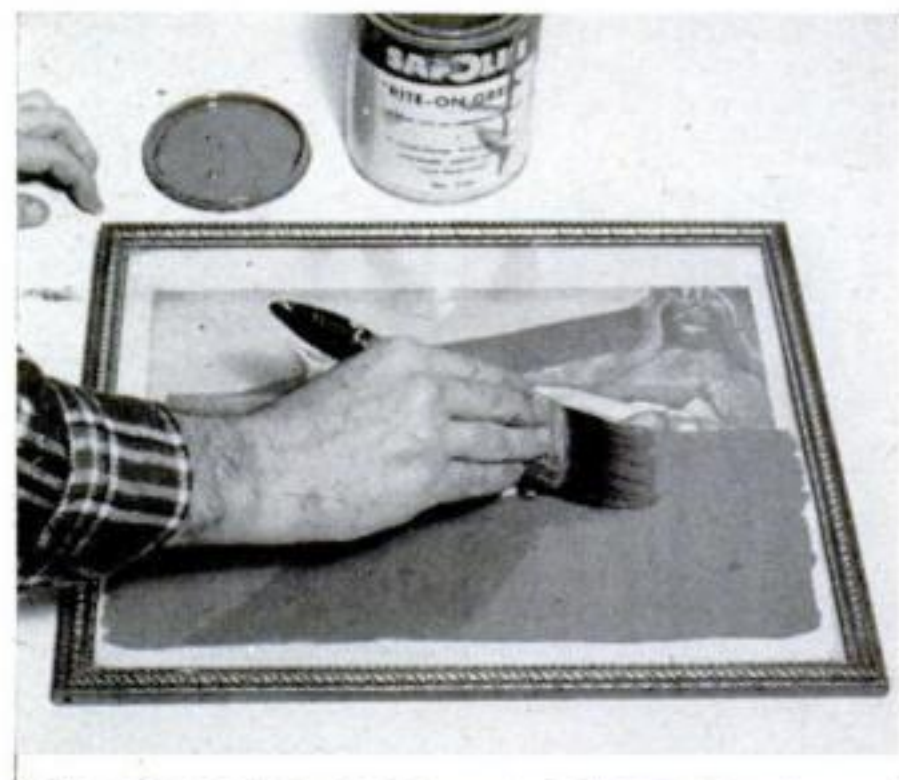
DARKROOM USES. Here you can jot warnings about film changes, location of borrowed equipment and lists of needed photo supplies.



INDIVIDUAL CHALKBOARDS. Any fair-sized scrap of plywood or hardboard can become a slate. With colored chalk, children welcome them.

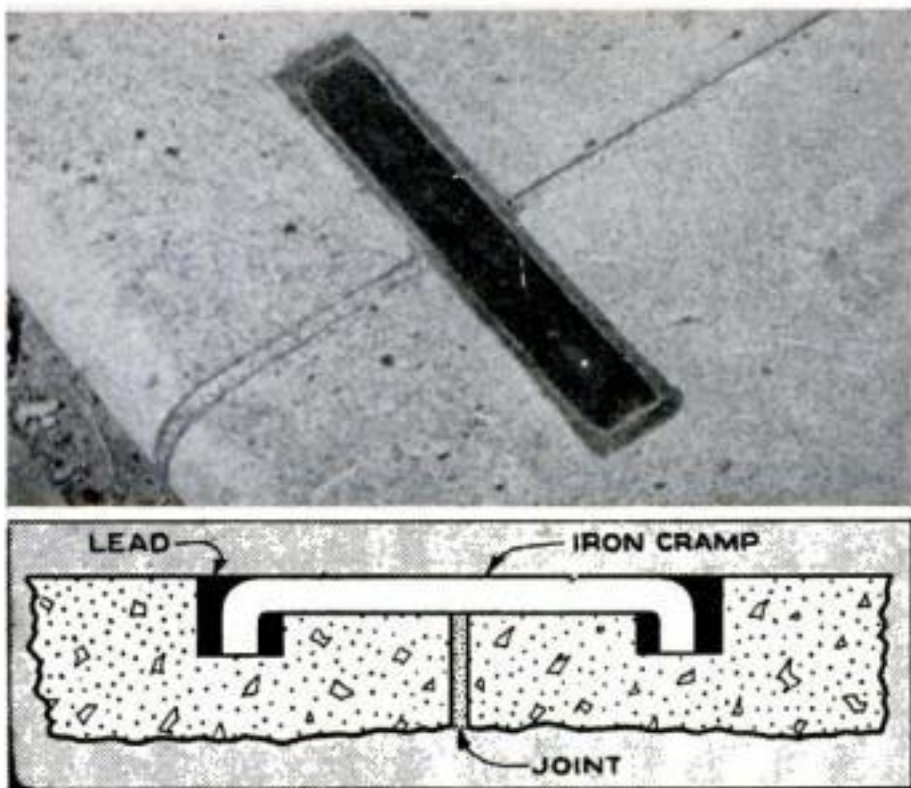


SCOREBOARD FOR GAMES. Reusable scoreboards for many games can be made by painting or taping white lines across a chalkboard.



PAINTING ON GLASS. Chalk paints take nicely on glass. An old picture frame can become a bulletin board to be hung anywhere.

Cramps Keep Stones Level



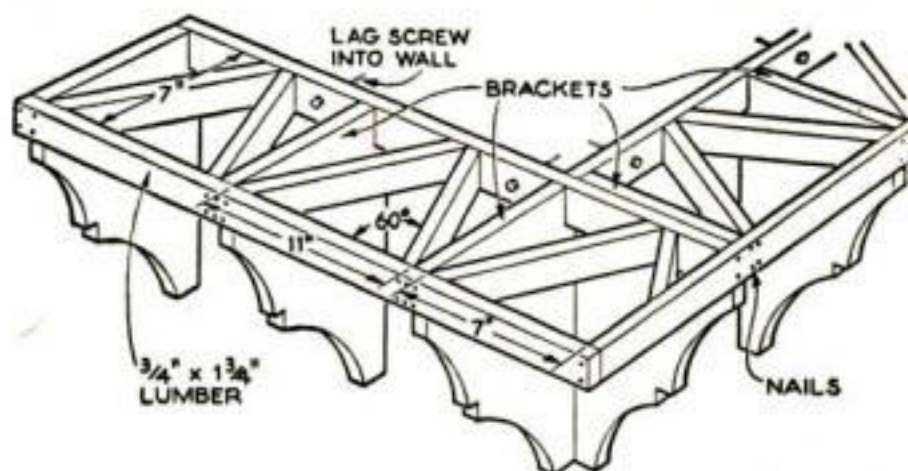
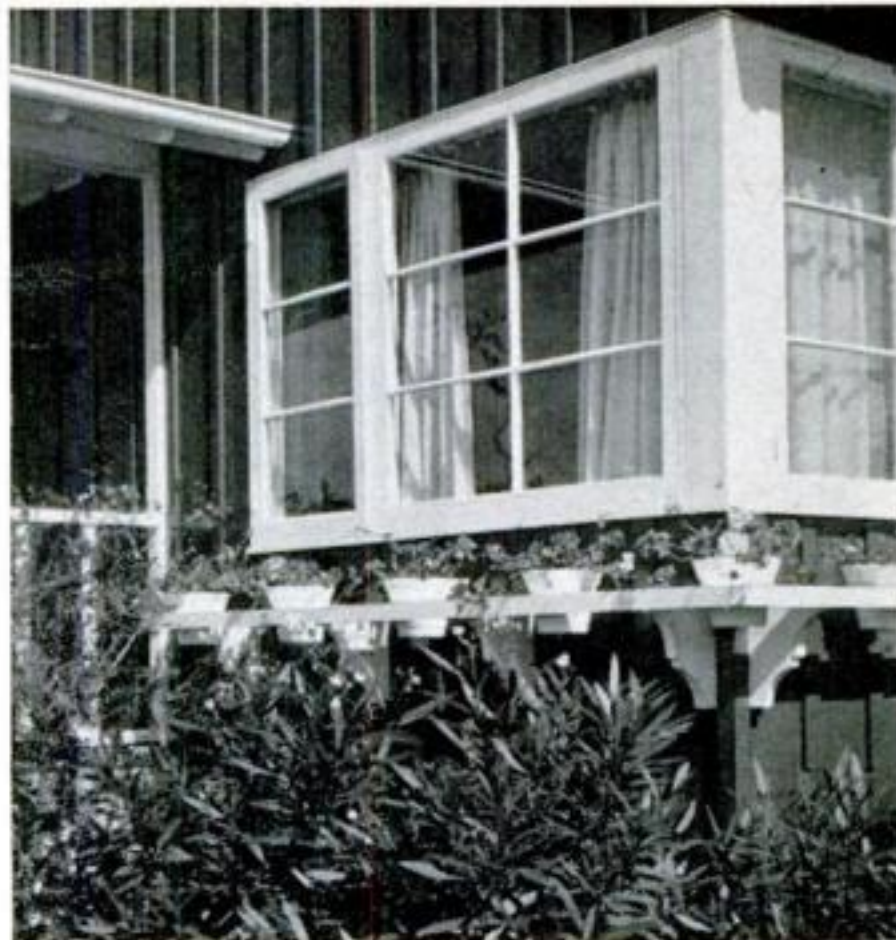
AN OLD-TIME stunt that can be adapted to present-day construction is the use of lead-embedded cramps. These are strips of iron that tie together sections of stone steps and other construction units. Holes are star-drilled and grooves chiseled as shown in the drawing. The cramp is put in place and molten lead poured around it. The cramps keep the sections of stone even with each other.—Walter E. Burton, Akron.

Storing Small Paintbrushes

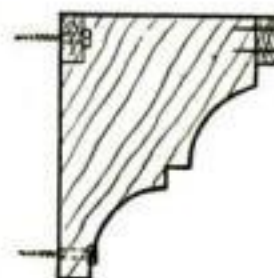
It's easy to misplace small paintbrushes but you can keep them together like this. Thread a screw eye in the end of each handle and hang the brushes on a curtain-rod hook.—J. J. Rea, Urbana, Ill.



Flowerpots Held in Shelf



THIS unusual and attractive design for a flowerpot shelf is easy to build. The parts for the frame can be sawed with the aid of a miter box while the brackets can be jigsawed to shape. Vary the dimensions to suit the size of the pots you want to use. Lag screws hold the frame to the house.—Hi Sibley, Nuevo, Calif.



Solenoid Valve Lets This Poultryman Sleep Later

A SOLENOID valve serves as a hired hand for Kenneth Lane of Claremont, N. H., and lets him get a few extra hours of sleep. It turns on the gravity water system for his 24,000 hens. The time clock that operates the poultry feeders and the lights that give his hens a longer "working" day also operates the solenoid. Lane's right hand is shown on main-line valve, which allows rising water to pass and turn down tube to waterer. Other hand is at solenoid, mounted on by-pass. Although main valve is shut off at night, solenoid lets water through as long as lights are on.





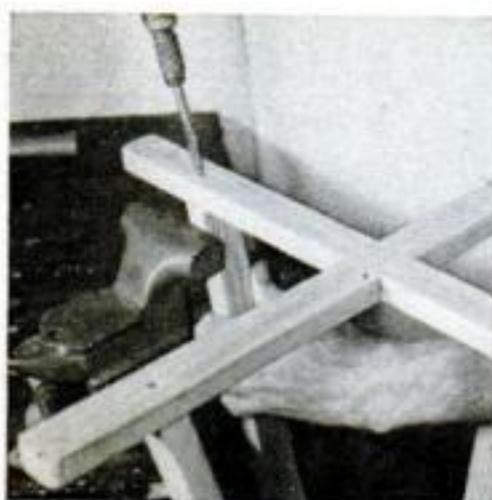
A Kitchen Stool

This wooden one costs less than a cheap metal stool, has features that some of the costliest lack.

PLENTY of house chores keep your wife on her feet, but a stool will let her sit down to some kitchen jobs. This one has a swivel seat, an adjustable back rest and casters. With power tools, you can make it in a couple of evenings.

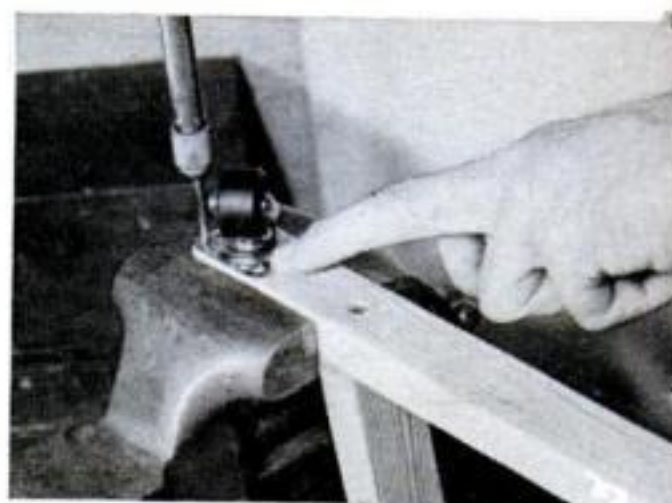
You need only $\frac{3}{4}$ " stock, if you do some extra gluing. The pivot block in which the seat turns, for instance, can be glued up from four $\frac{3}{4}$ " thicknesses.

Legs and seat. Half-lap the cross members at the center and glue them together. Cut the four legs to length, being careful to get the angles alike. If you have no wide stock, glue up the seat from narrower boards



PUT PLENTY OF GLUE on ends of legs. Drill cross members and attach with a $1\frac{1}{4}$ " screw in each leg. Crosspieces shown at left were cut extra long. They need not extend beyond the legs.

FLUSH-MOUNTING CASTERS go on ends of cross members (right). They will be right under the legs if you use shorter crosspieces, as in the drawing. Mount casters with $\frac{1}{2}$ " No. 6 screws.



THERE WAS NOTHING WRONG with this chair except that you couldn't sit in it. The back and frame were still like new when the webbed seat gave way.

Clothesline and Foam Rubber Renew Damaged Webbing Seat

THAT extra chair you need may be stored in your attic. Many an otherwise good one is discarded because a woven seat of cane or webbing is torn.

Caning and webbing aren't available at every cor-

FRAME WAS STRUNG with plastic clothesline to make new seat support. Holes were first drilled $1\frac{1}{4}$ " apart in side rails with a $\frac{1}{4}$ " bit. The clothesline was laced through them and securely knotted at both ends.



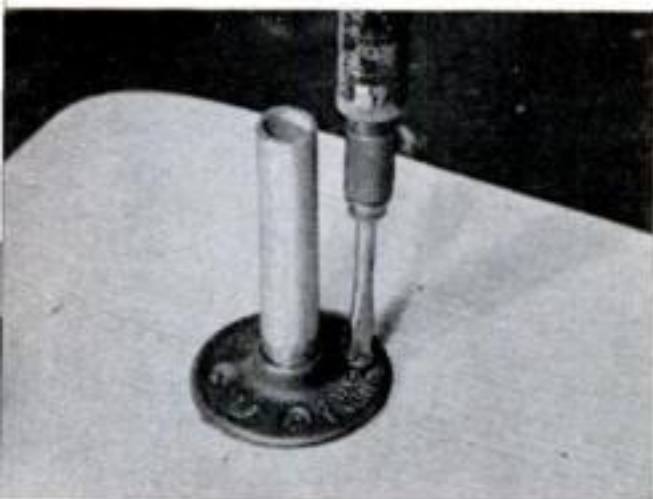
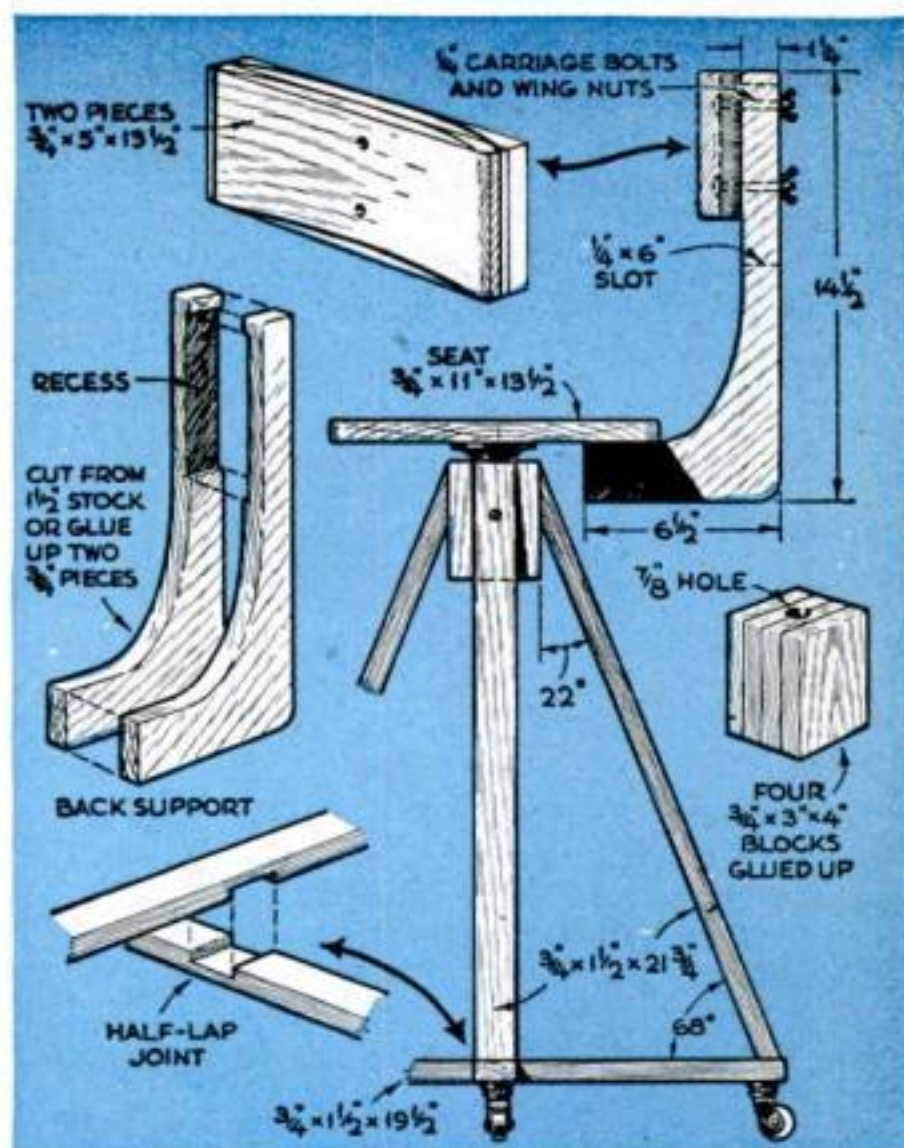
for Your Wife

with dowel or spline joints. Round edges.

The slot in the back-rest support can be made with a router bit, or by dropping the piece over the circular saw and finishing with a handsaw. Another fast way of making the slot is to glue pieces of $\frac{3}{4}$ " stock after stop-recessing the inner faces $\frac{1}{8}$ ".

Curved back. You may be able to use a curved seat back from a discarded chair. Otherwise, bandsaw it from a block made of two $\frac{3}{4}$ " pieces. Lacking a bandsaw, you can cut off waste with a handsaw and then plane, rasp, joint or power-sand it.

Glue and screw the legs to the pivot block. The photos show the rest of the assembly job. After you've tried the stool out, don't forget it was meant for the kitchen. You can always build another to keep in the shop.—*John Rogers, Dallas.*



SWIVEL PIN is a 4" length of $\frac{5}{8}$ " pipe (left) screwed into a floor flange. Mount flange with four $\frac{1}{2}$ " No. 8 screws. Attach seat-back support with glue and $1\frac{1}{4}$ " screws.



STOOL CAN BE FINISHED with clear lacquer, stain and varnish, or color to match kitchen cabinets. To fit seat, drop pivot pin into block (right). Grease or graphite will stop squeaks.

ner hardware store, but plastic clothesline is. The photos show how this durable, waterproof material was used to rebuild the seat in a patio chair.

Foam rubber can be bought for home upholstery or in the form of kneeling pads. Inserted in a flat bag made of old carpeting, it becomes a seat pad that adds a lot to the comfort of the chair. If it gets dirty, you just pull out the rubber pad and wash the covering bag.—*Darrell Huff, Sonoma, Calif.*

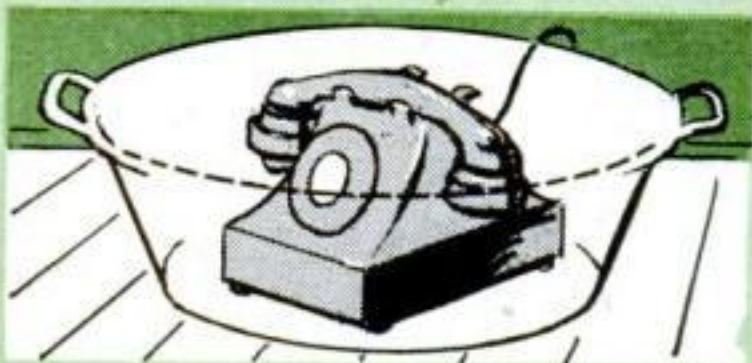


SEAT PAD WAS MADE by sewing an envelope of old carpeting (cotton bouclé here) to fit chair. Pad of 1" foam rubber is inserted and flap tucked in. It's a cinch to remove pad to wash the cover.

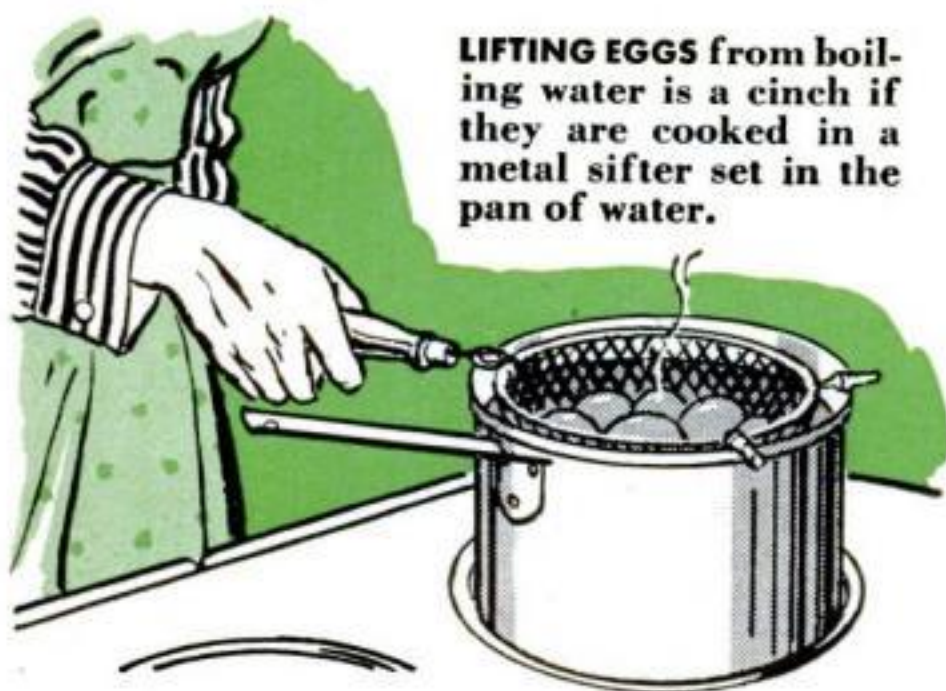


NOW IT'S SITTABLE AGAIN. New seat is more comfortable, and adds color to the chair. This one is pale green, which goes well with gray webbing.

Keeping the Home Shipshape



YOU'LL HEAR THE PHONE when it rings upstairs while you are working in the basement, even with shop machines running, if you stand it in a metal pan and place it on the floor.

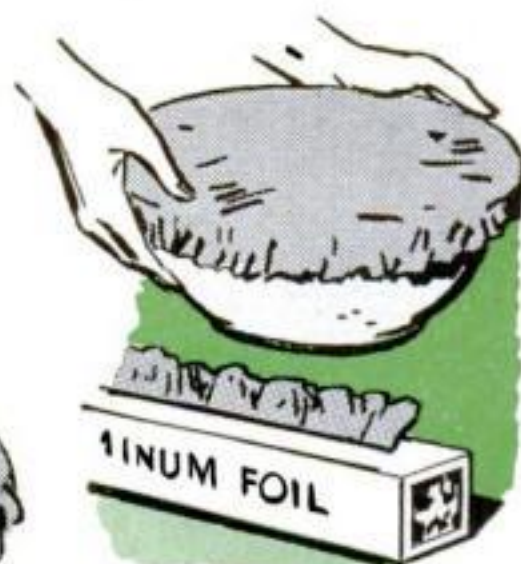


LIFTING EGGS from boiling water is a cinch if they are cooked in a metal sifter set in the pan of water.

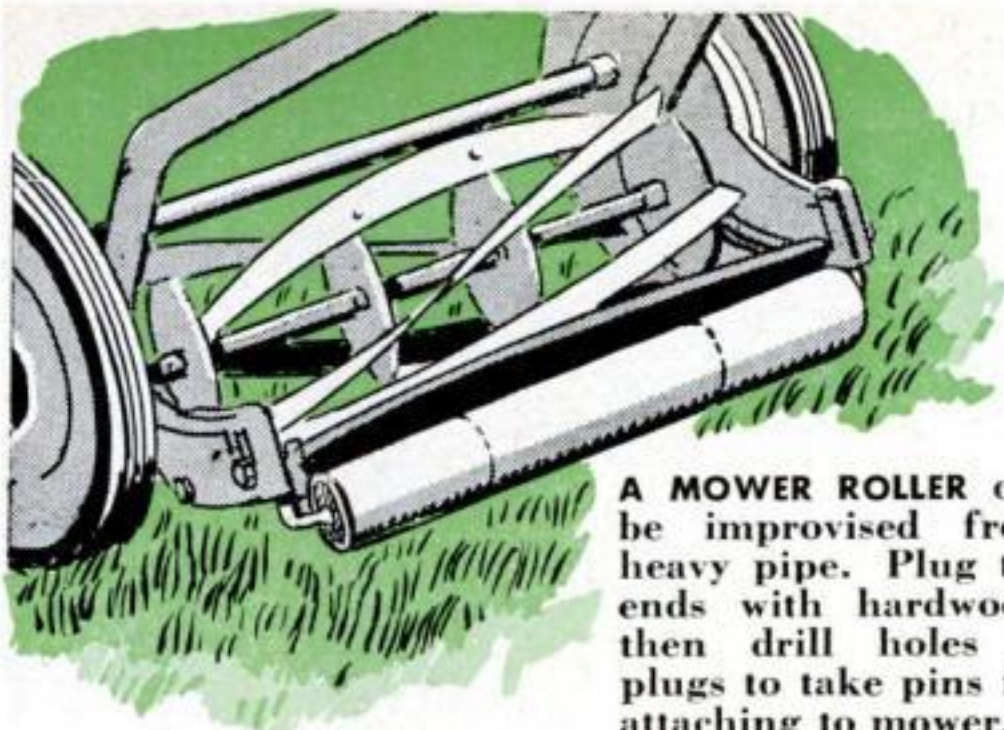


WATER SPOTS on a newly painted white ceiling can be made less conspicuous by covering them with one or two coats of liquid white shoe polish. It does an adequate job until you repaint.

TO PLANT SEEDS of very small size, try using a salt shaker. It spreads them evenly, and you can vary the flow by how much you tilt it.



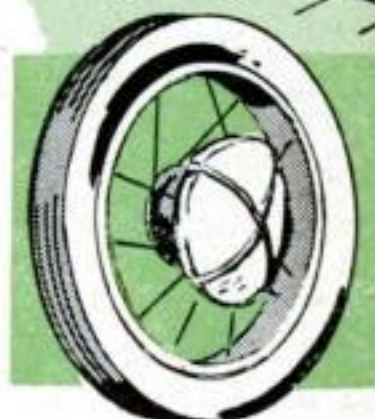
A BROKEN COVER need not end the life of a casserole dish. Aluminum foil bent tightly around the sides of the dish will serve just as well as a lid.



A MOWER ROLLER can be improvised from heavy pipe. Plug the ends with hardwood, then drill holes in plugs to take pins for attaching to mower.



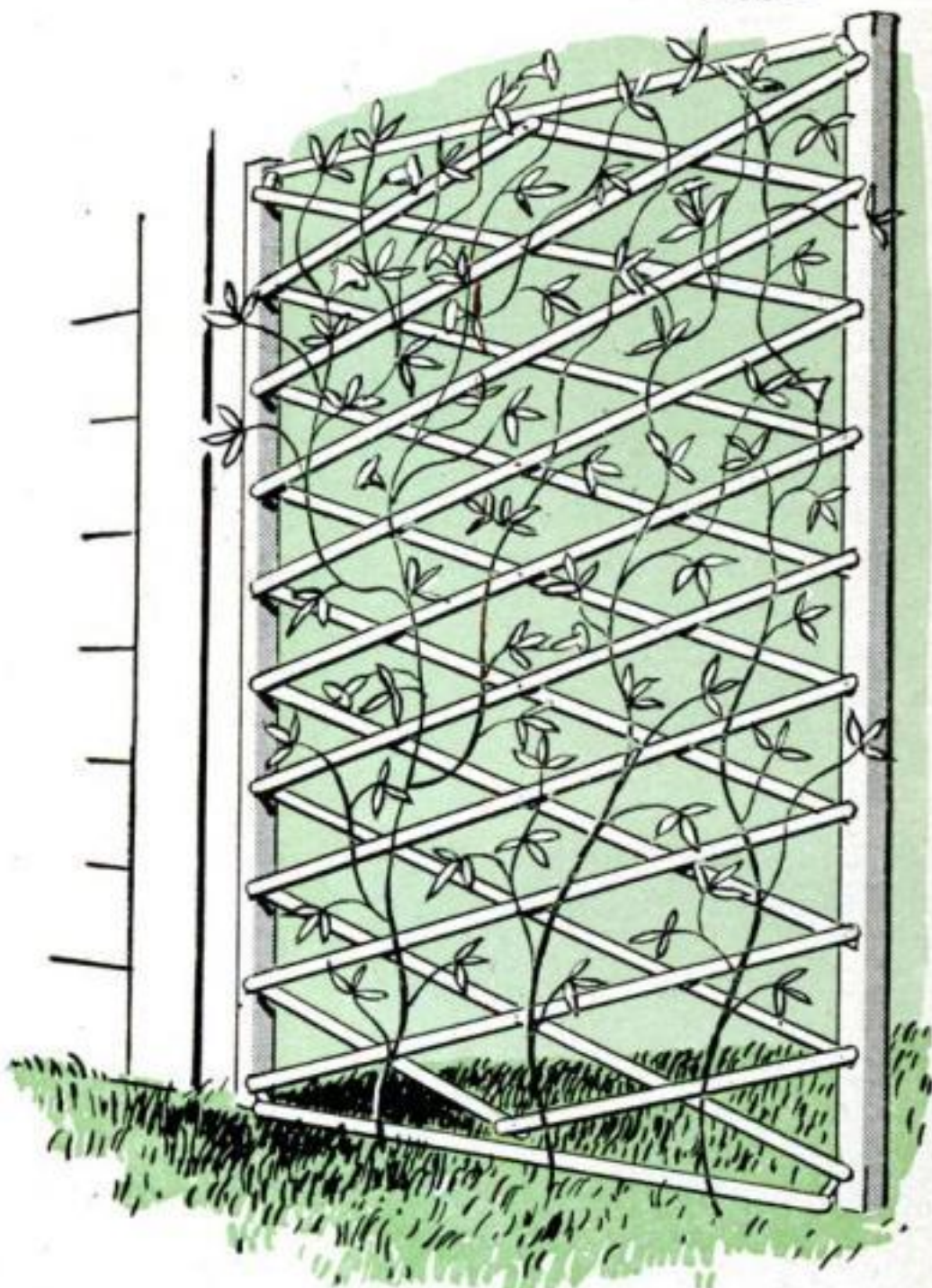
CARRIAGE HUB CAPS often scratch woodwork when passing through doorways. Sponge-rubber powder puffs tied over the hub caps will eliminate this problem.



WHEN STORING BLANKETS of wool, clean them and place on top of the storage pile so they remain porous and fluffy. Crushed or soiled blankets lose the air cells which make them warm.



A TUB HOSE clamped in a spring-grip lamp holder will not thrash around when the washer tub is being filled.



A GARDEN TRELLIS for climbing vines can be made easily from a folding stairway gate. Open it to its full width and hang it vertically to the side of the house or to two upright posts set in the ground.

Making Your Own Black-Top Driveway



Ready to use right out of the drum, liquid asphalt poured over stone makes a tough, long-wearing surface.

HOW much of your gravel driveway did you shovel away with the snow last winter?

If you're tired of feeding your driveway a load of gravel or crushed stone every couple of years, you can use a cold-asphalt binder to lock the next load down for keeps. You'll have a driveway with a hard, long-wearing surface besides.

The binder is the same asphalt used to build highways and airport runways, but it's now available in small quantities—52-gallon drums. Called Colas, it is made by the Shell Oil Co. It's an asphalt emulsion—tiny bits of asphalt suspended in water. Be-

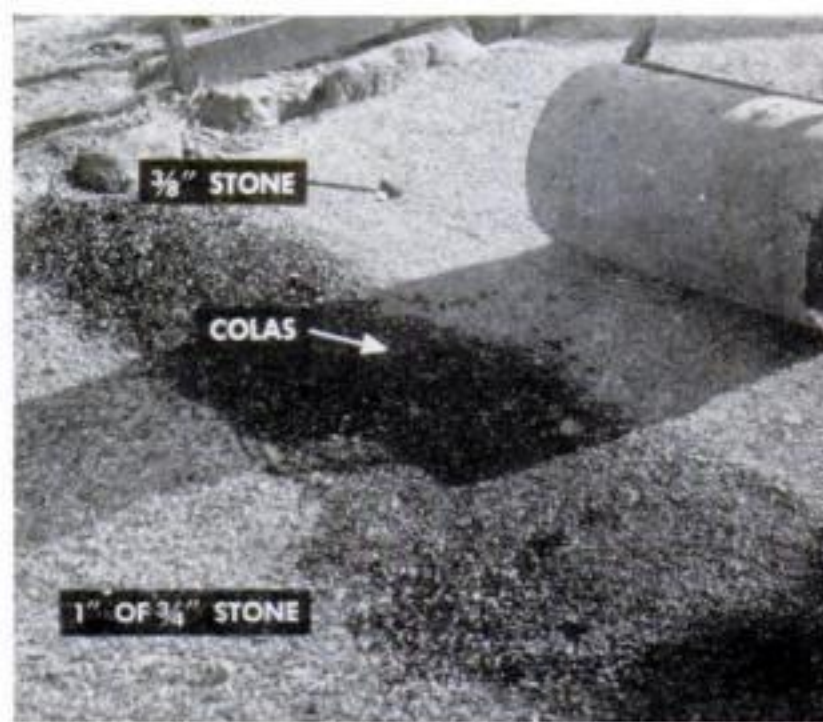
cause water is used, there is no fire hazard and the mixture won't kill grass or shrubs. It comes ready to use from the drums. You don't have to heat it.

The photos show you how to put a hard top on an existing driveway. If you're starting from scratch with a new driveway, it's best to put down form boards at each side. Then excavate about 8" deep for the driveway. Put in 5" of fill—cinders or gravel. Roll or tamp the fill.

Spread a 2"-thick layer of 1" stone on the fill. Roll the stone. Pour Colas—about three-quarters of a gallon per square yard—over the stone. Follow with $\frac{3}{8}$ " stone, spreading about 25 lb. over each square yard. Roll again. Pour on more Colas. Put on another layer of $\frac{3}{8}$ " stone and roll it again. Wait about two hours before using the drive.



CROSS SECTION. These two photos show layers of stone needed for waterproof driveway. (Note that top layer in photo at left is same as bottom layer in photo at right.) Old driveway was raked to fill holes and to grade it for drainage. Colas was sandwiched between each layer of stone and the stone rolled. Final layer is $\frac{3}{8}$ " stone.





POURING. Garden sprinkling can with spout made from old tin can gets Colas on evenly. Big can with holes punched in bottom will do. Kerosene cleans Colas off tools.

SMOOTHING. Shovel will handle spreading of stone, but push broom is good for final leveling before rolling. Water-filled lawn roller was used to pack stone.

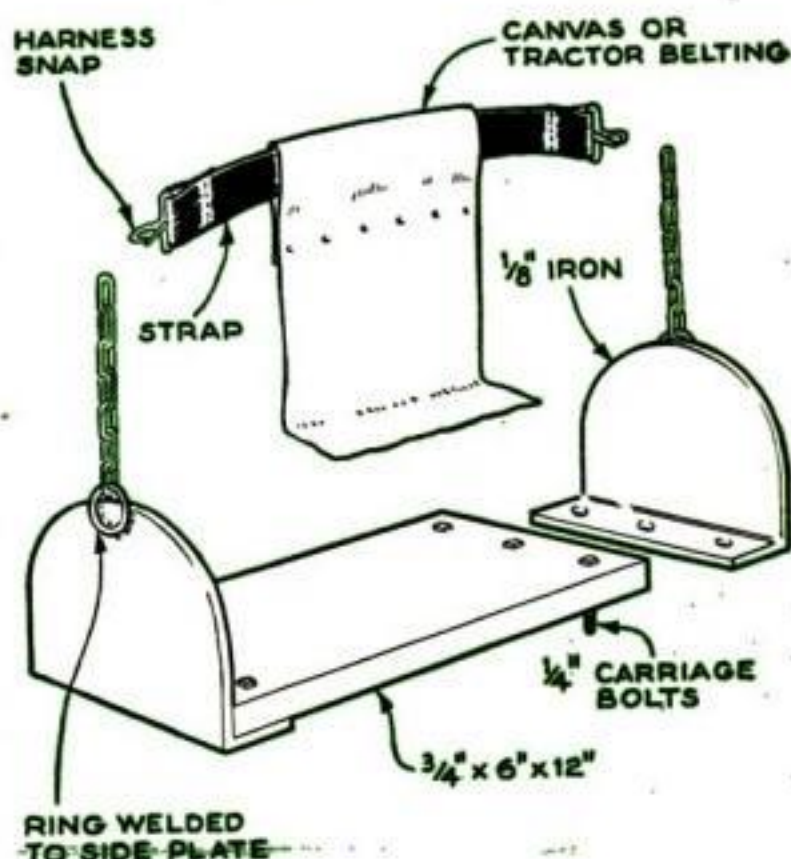


PROTECTING CONCRETE. Sidewalks, curbings and garage aprons can be protected (above) from Colas stains by covering them with building paper or a layer of sand.

TAMPING. In spots where roller won't go—such as against this concrete walk—use tamp to set stone solidly. This one was made of one-by-threes and block of heavy wood.



Safe Swing for Small Fry



With this seat, a small child cannot fall backward out of the swing. The back support is comfortable because it will yield to the child's weight. It can be made mostly from junk-box materials.—Hi Sibley, Nuevo, Calif.

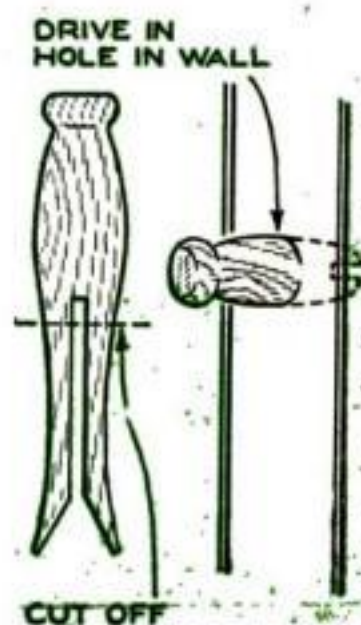


Jar Caps Cast Lead Weights

LAMPS, book ends, doorstops and many other projects require additional weight for stability. Jar lids make ideal molds for casting flat weights of lead, which can be melted right in the jar lid on the kitchen range. The weights are easily drilled to make holes for screws that attach them to the project.—N. Mocharniuk, Gilboa, N.Y.

Clothespins Make Wood Pegs

WOODEN pegs look better than nails or hooks for hanging clothes. Clothespins, sawed off as shown and driven into drilled holes, make good pegs. Drill the holes a little smaller in diameter than the pegs to insure a tight fit, and dab on glue.—V. H. Lamoy, Upper Jay, N.Y.



Platform Rings Doorbell When Pet Wants to Come in the House

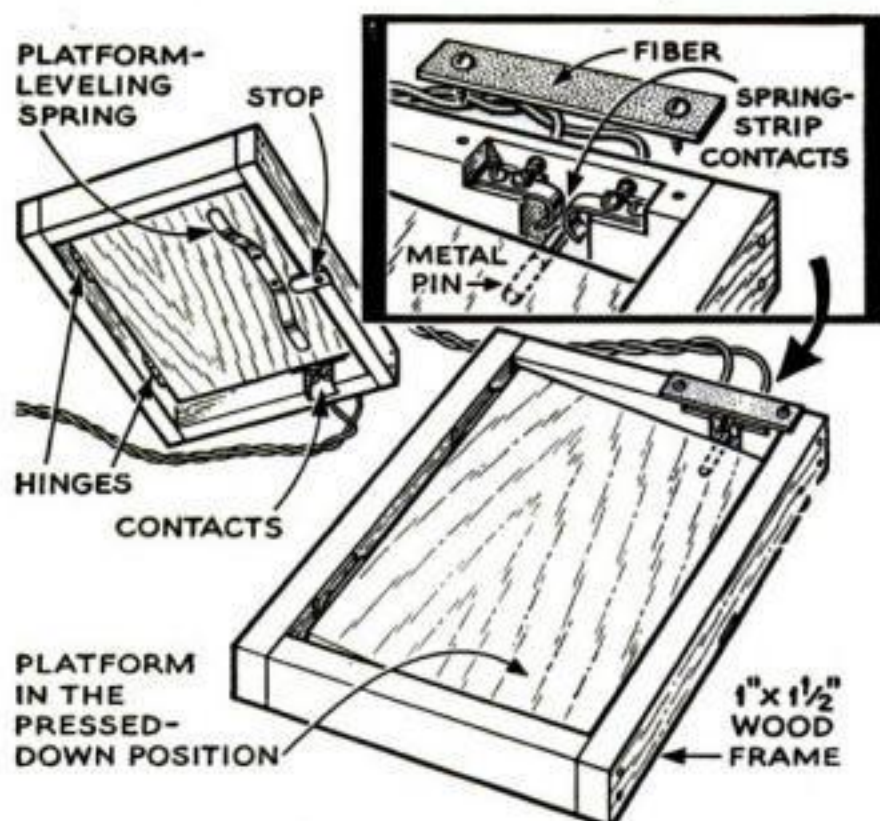


OUR cat doesn't claw the screens or scratch the woodwork to let us know he is waiting to get in. He announces himself by perching on this platform bell ringer. It gives one short ring when he climbs on, but does not ring continuously.

I made the plywood platform 1' square.

This size doesn't clutter the porch and is just right for most pets; those too large to sit on it can work it with their front paws.

The platform is in a frame and hinged at one edge. At the other edge I attached a spring that yields under the animal's weight but levels the platform when he steps off. I notched a corner of the frame for two springy contacts and wired them to my doorbell. A metal pin in the platform brushes both contacts as it passes between them.



The ringer is placed out of line of door traffic and a coat of light paint makes it visible even in shadows. Other members of my family find the toe-operated signal useful when they come home from shopping with armloads of parcels.—*Hugh Lineback, Stillwater, Okla.*

Old Awnings Make Pup Tent



A SMALL tent for a child's play yard can be made from discarded awnings. Cut the fringed edges—if any—from two awnings. Sew them together at the top and at one end. Leave the other end open. A couple of poles and stakes complete the tent.—*C. V. Mobberly, New Matamoras, Ohio.*

Weed Guards Made from Tires

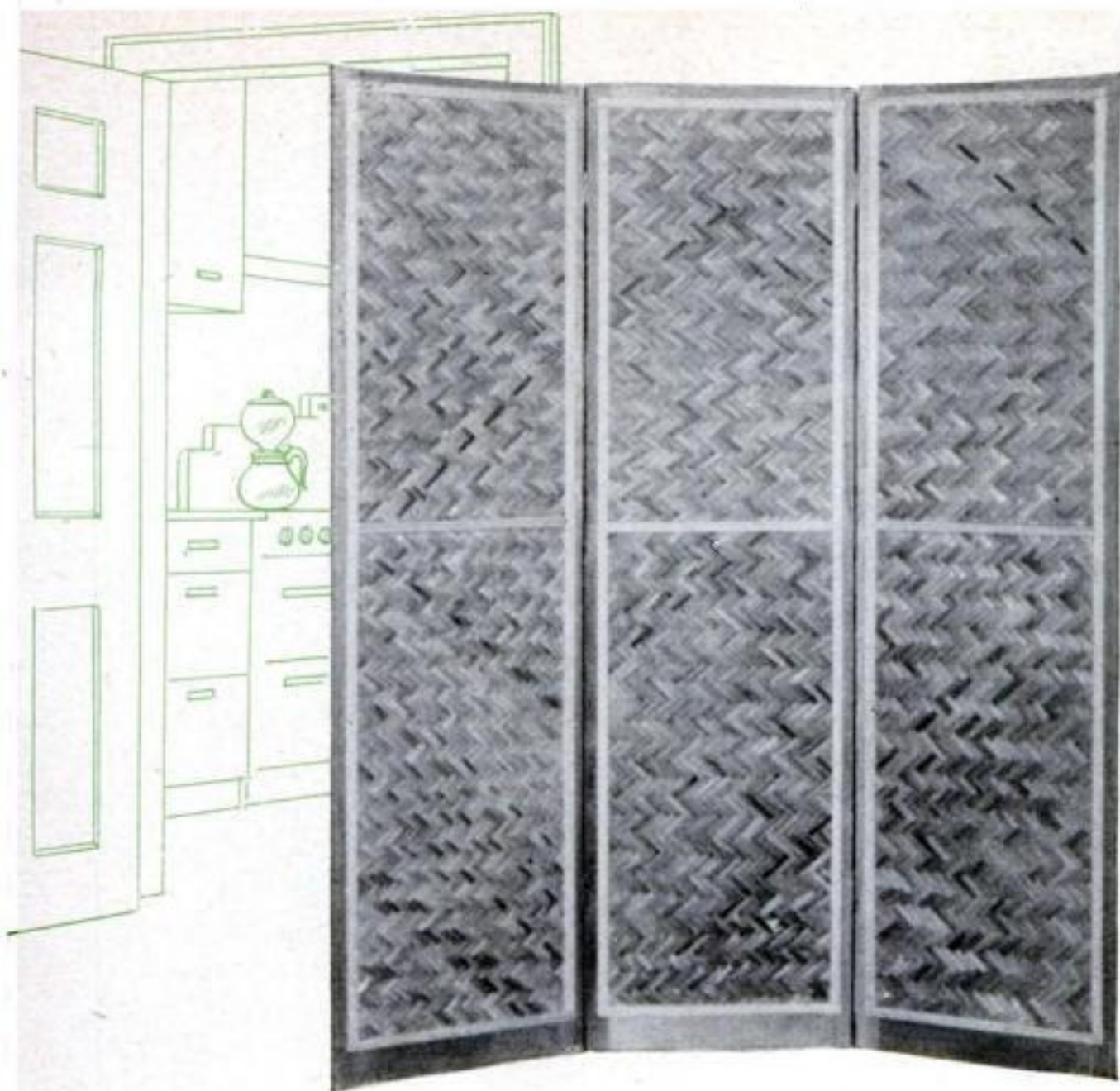


WEEDS and stalks can be kept out of plow-beam notches by sections cut from old tires. Carl Bieri of Latham, Mo., wires the tire sections to the beams, as shown above. Weeds are brushed off by the rounded faces of the tires.—*L. H. Houck, Jefferson City, Mo.*



Eave Trough Serves as Nail Tray

WITH a scrap of eave trough and a pair of concave blocks you can turn out a handy nail tray. Suit yourself about the length and the number of compartments. The partitions can be made of $\frac{1}{4}$ " or $\frac{3}{8}$ " plywood.—*Victor H. Lamoy, Upper Jay, N.Y.*



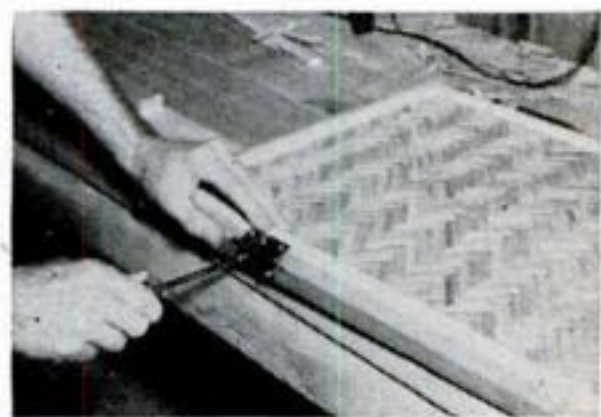
GLUE AND CLAMP each frame. Measure the corners diagonally to make sure that they are square, and reinforce the butt joints with corrugated fasteners. Dowel heavier screens.



COVER THE FRAME with straw matting. Leave enough excess so that you can pull it tight as you nail the molding. If you need two pieces of mat, butt them under center molding.



TRIM EXCESS MATTING with a sharp knife or razor. Test the screen for loose edges. If you find any, drive a few extra brads to hold it securely all around the frame.



HINGE THE SECTIONS with $1\frac{3}{4}$ " by 2" brass butts. Turn them so both wings fold in the same direction; for some uses a back-to-back Z arrangement might be better.

Folding Screen Is Hammer-and-Saw Job

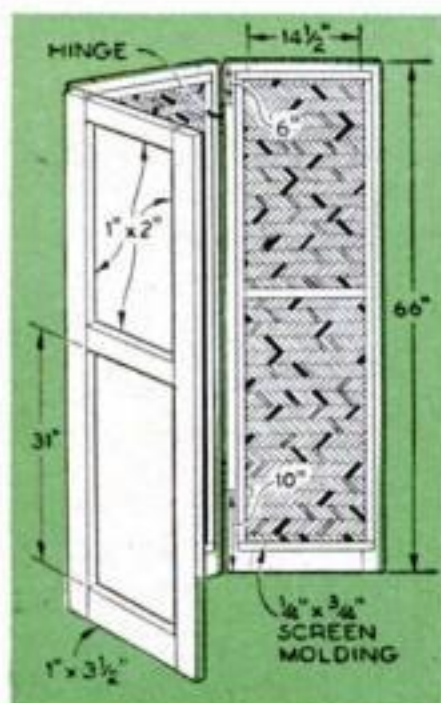
Straw mat on a wood frame makes this room divider.

A MODERN folding screen not only makes two rooms out of one, but decorates each. Building it is a simple hand-tool job.

I covered this screen with straw matting because it has a cool look, keeps its shape and is easy to clean. To suit your decorative scheme you could substitute burlap, painted canvas or stiff cardboard trimmed with wallpaper. Construction is the same for all.

I used 1" by 2" redwood for all frame members except the bottom rail. A $3\frac{1}{2}$ " strip across the bottom gives the screen greater stability. The joints were glued and butted and reinforced with corrugated fasteners. This method is simple and plenty strong for a light frame; but if you use heavier stock or more sections, it would be better to dowel or tenon the joints.

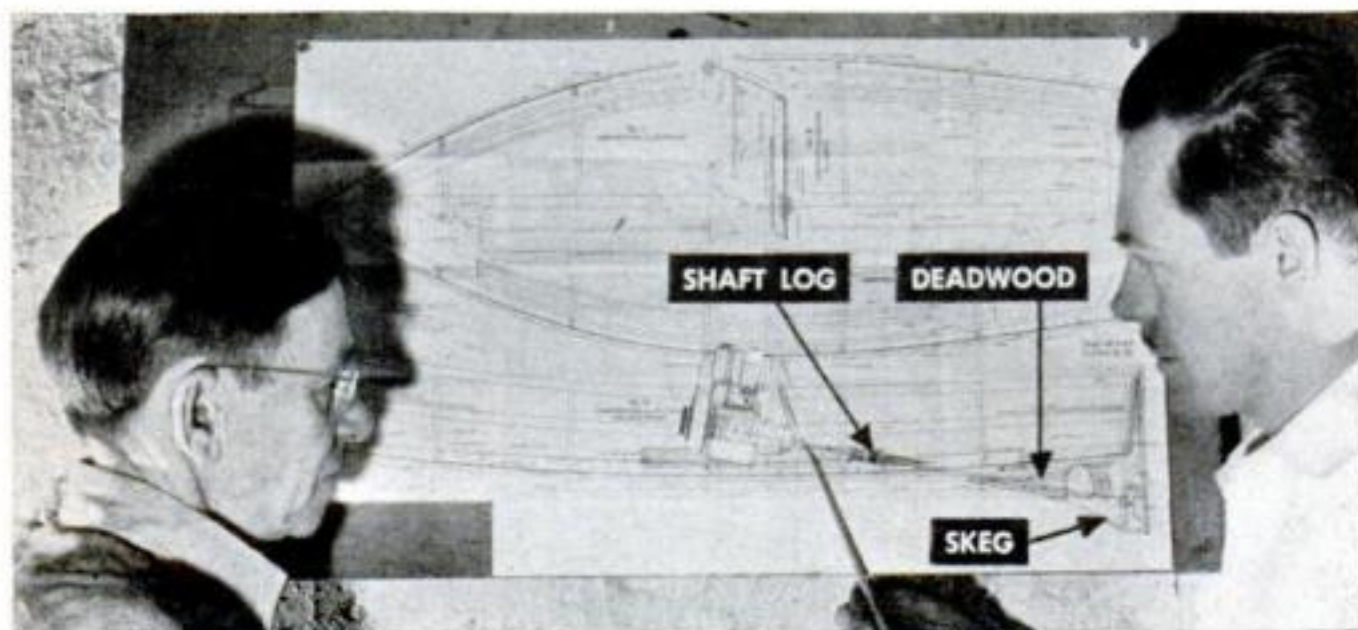
After sanding the frame smooth I laid sheets of straw matting over it and fastened them to the frame with molding strips and 1" brads. Hinging the sections and spraying the screen with clear lacquer finishes the job.—John Rogers, Dallas.



Putting Inboard Power in a Rowboat



You can stow away the oars next time you go fishing if you install one of these small air-cooled engines amidships.



LAYOUT. Much can be learned from plan of boat and motor. Paste side view of engine on profile of boat. Drawings must be same scale. Engine was photographed from manufacturer's bulletin and scaled with enlarger.

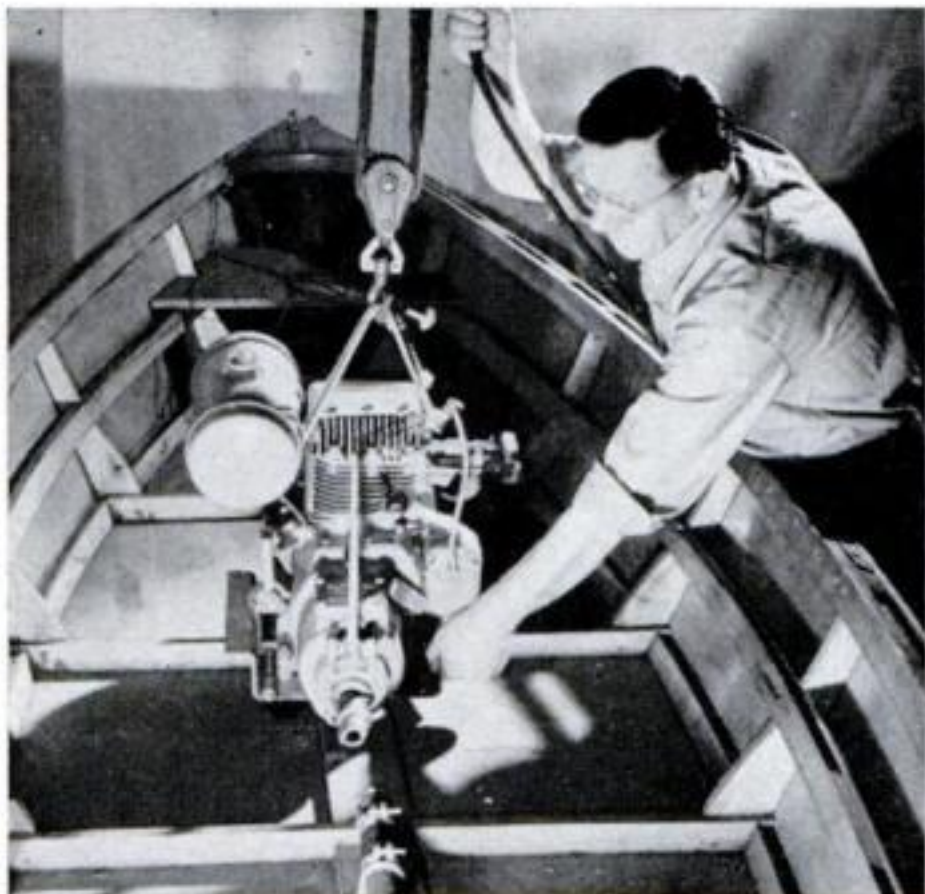
By E. F. Lindsley

LIKE most of the fishermen I know, my yen to seek out the big ones at the other side of the lake is often frustrated by a white-collar constitution powering the oars. An in-board power plant for my row boat, using a fast-starting, heavy-duty engine that could

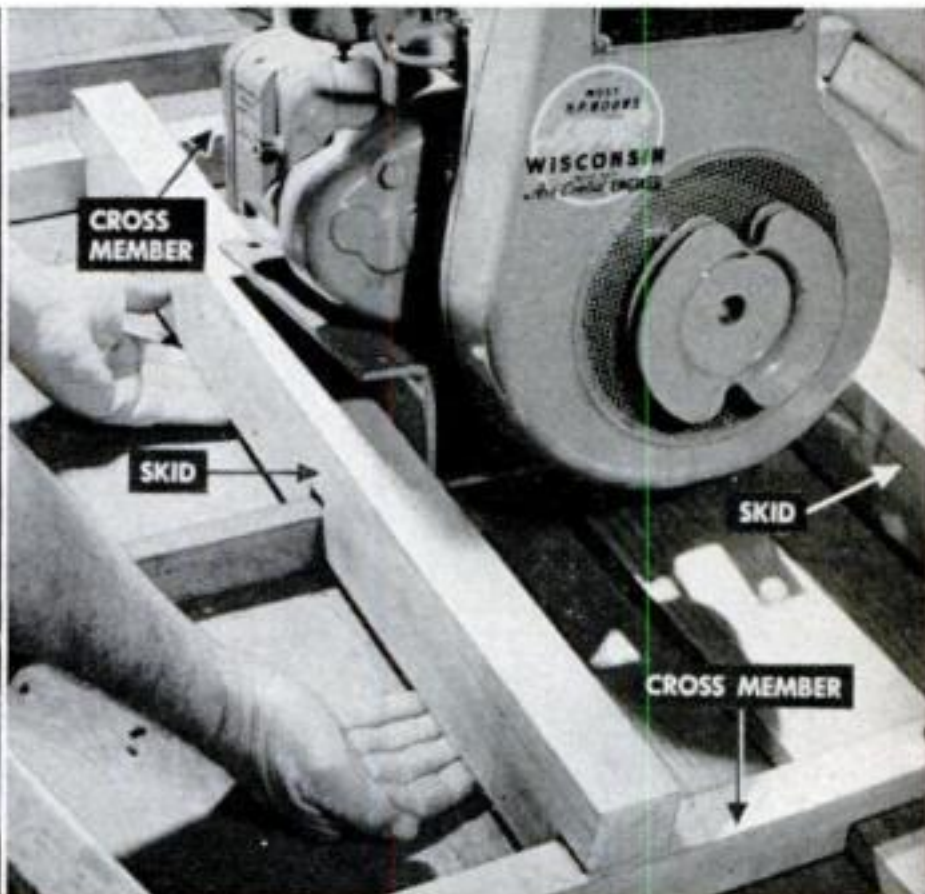
put out horsepower all day long, appealed strongly to me.

From the beginning, it was a choice between the economy of a secondhand put-put without a reverse gear and the higher cost of a new or rebuilt engine with a reverse gear, bronze fittings and stainless steel shaft.

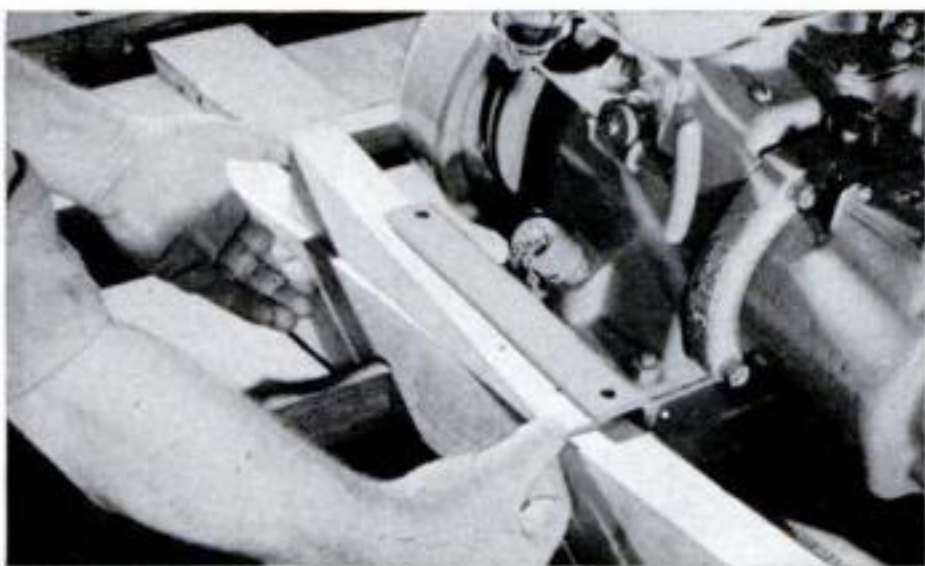
Combinations. More important than



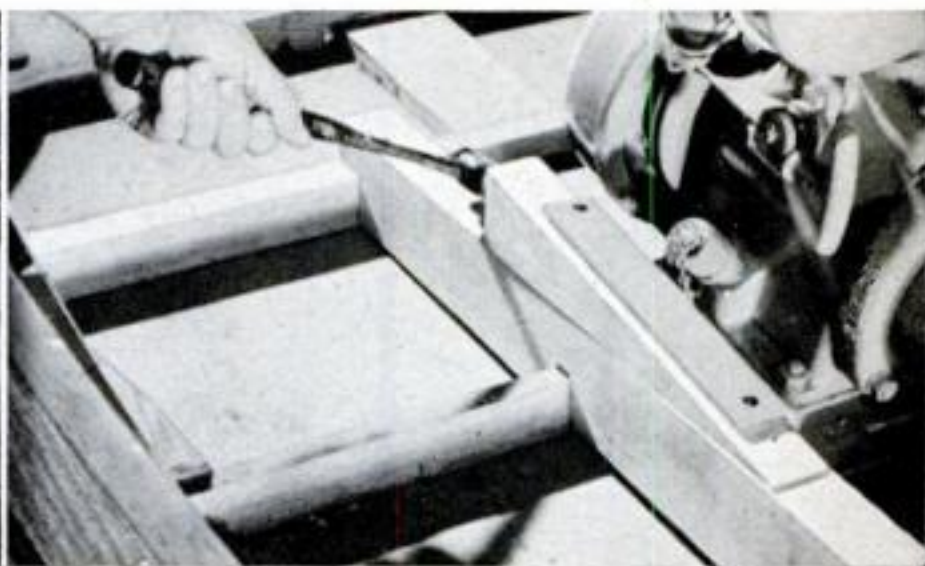
1 ENGINE LOCATION. Lower engine into experimental location to help visualize what's needed for engine mounts. Approximate location of shaft log also was noted.



2 ENGINE SKIDS. Made of hardwood, skids and cross members must be fitted to match boat structure. Clearance under skids permits flushing of oily bilge.

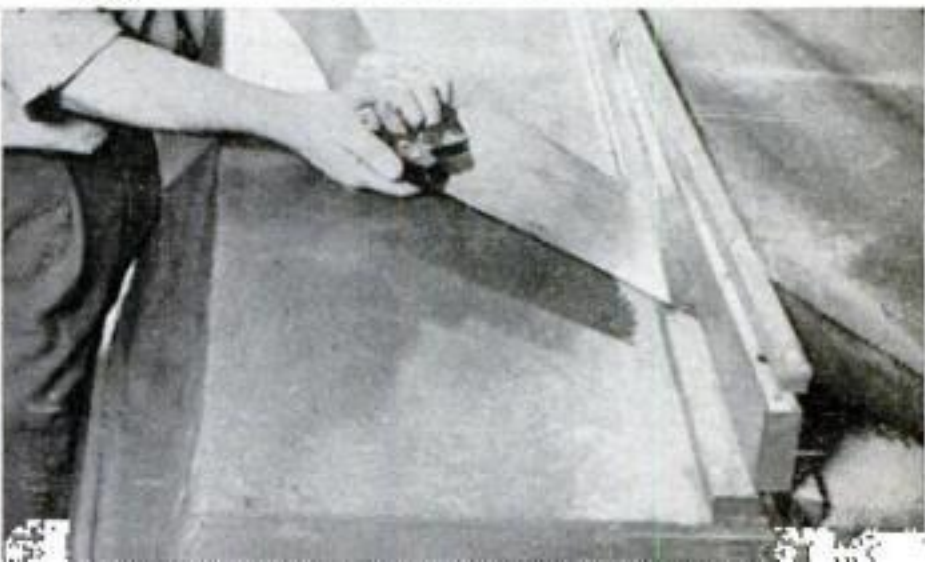
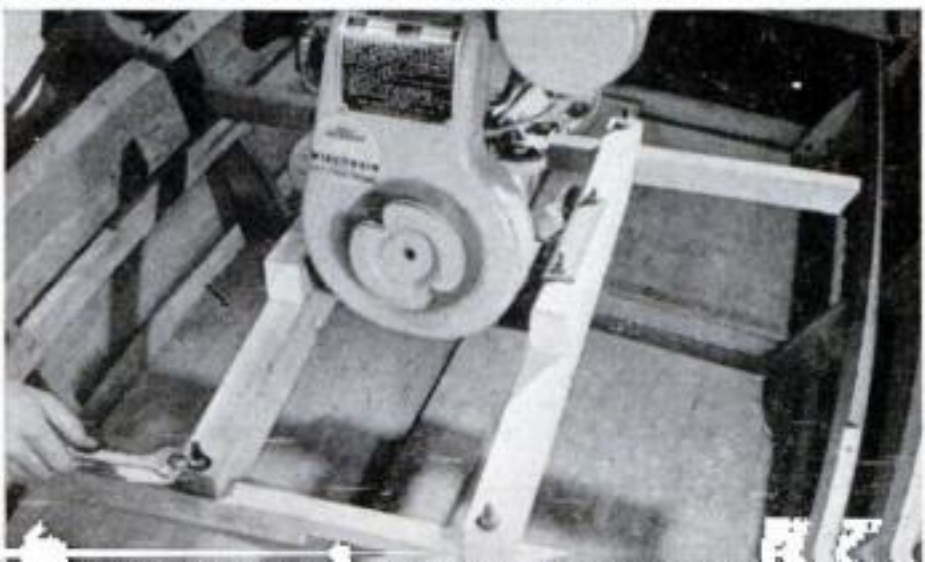


3 WEDGES. Cut wedges to angle specified by engine maker. These are 11°. Engine builder said to stay under 15°. Angle will be greater when boat is under way.



4 FINAL LINE UP. Locate engine accurately so shaft will be on center and run true without offset. When properly lined up, mark bolt-hole locations and make alignment marks.

5 ASSEMBLED ENGINE MOUNT. Bolt engine to mount and try assembly for final fit. Don't bolt mount to boat framing members since next step requires turning hull upside down.



6 OLD KEEL. Saw off old keel and hacksaw any screws to provide true working surface for mounting rear strut and deadwood. After sawing, plane and sand surface smooth.

my own calculations were the bits of advice I got from a marine-equipment dealer. He pointed out the possible combinations I could make up: an open propeller shaft with a strut-mounted stern bearing, a simple stern bearing mounted on a deadwood, a self-adjusting shaft log for water sealing within the boat, or a plain bearing and pack-type seal mounted on a block and serving the same purpose as the shaft log.

The setup shown here is a compromise because I am experimenting with different engine-and-propeller combinations. Thus, the stern bearing with an adjustable angle permits slight changes at the engine end with the boat structure left as is. Even so, some of my friends say the deadwood might have been dispensed with on a boat as small as mine. I felt that it added rigidity that was partially lost when the original keel was removed. It also is a lot of protection against a bent shaft when the boat is beached. After all, working out a design that suits your own kind of boating is half the fun.

Power plant. The engine location slightly ahead of midships worked out about right for shaft angle. It was selected to provide good balance while I sat in the stern and trolled. The engine and reverse gear together weigh 105 pounds, put out a top of 5.8 hp. at 3,200 r.p.m. and will cruise with a 3-hp. output at 1,600 for long trips.

Regardless of the engine selected, there are certain features that should be added if the engine has not been built for marine use. For safety, and to comply with the law on waters under Federal supervision, the carburetor intake must have a flame arrester. Some form of shielded exhaust pipe is a good idea. The one shown will prevent burns in case I fall or brush against it. A water-jacketed exhaust with an underwater outlet would be still better. A center-bowl carburetor intended for use on engines subjected to tipping to various angles will help reliability, and a good fuel filter ahead of the carburetor will do much to prevent stalling.

Gearbox. The reverse gear is a feature that is worth what it costs to most boatmen. It can't be beat for convenient starting, maneuvering out of tight spots, quick slow-downs and unwinding weeds from the propeller.

The boat pictured is strictly for inland waters. Its shallow draft and light weight work out well for sneaking into the low-water weed beds after bass in the evening. The engine, however, is capable of handling

a much larger and heavier boat very easily.

The same thing applies to the materials selected. I used stainless-steel shafting, stainless tubing for the rudder post and galvanized sheet steel for the rudder. The latter is protected by antirust paint. For salt-water use, a bronze rudder with integral shaft is better.

A salt-water sailor might also want to

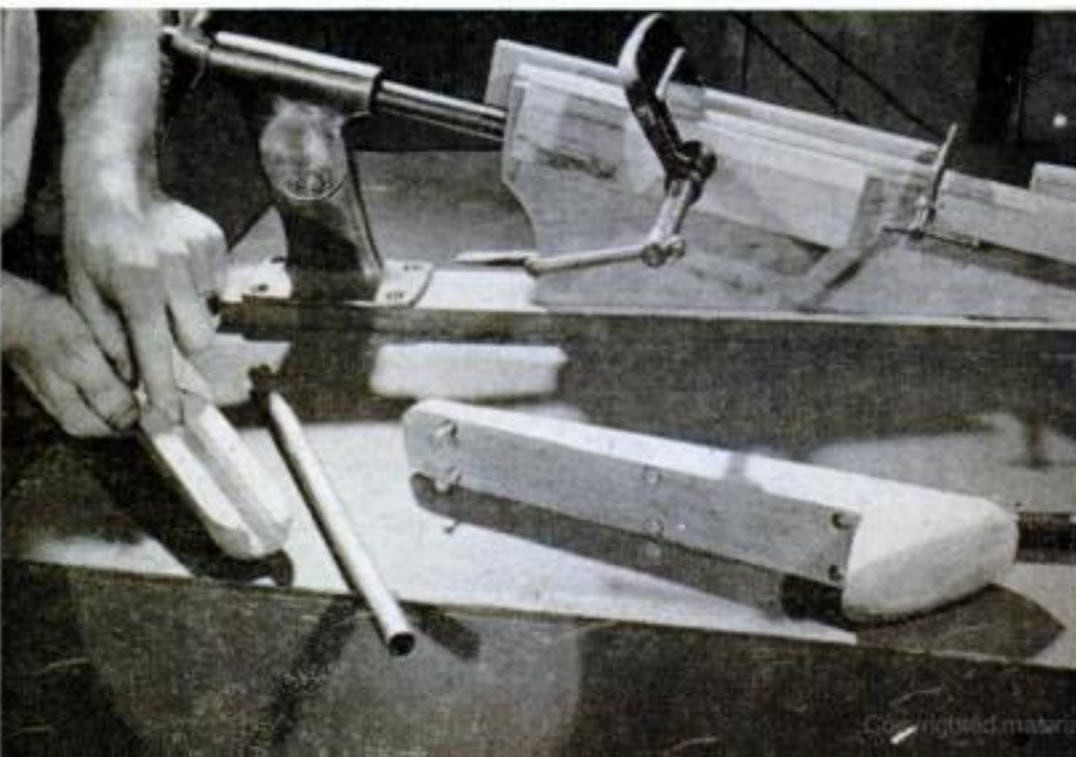


7 DEADWOOD. This is triangular member made of hardwood, through which propeller shaft runs. You can slot it as I did (above) or drill hole for shaft.



9 SHAFT HOLE. Cut into keel with chisel to give auger bit or drill a square bite. If hole in hull is not drilled at exact shaft angle, you may have to open it with chisel.

12 RUDDER-POST SUPPORT. Shape this of oak. I used a length of stainless-steel tubing inside as a bushing for rudder post. Tubing fits in channel between split rudder-post support. Work calking compound into channel.

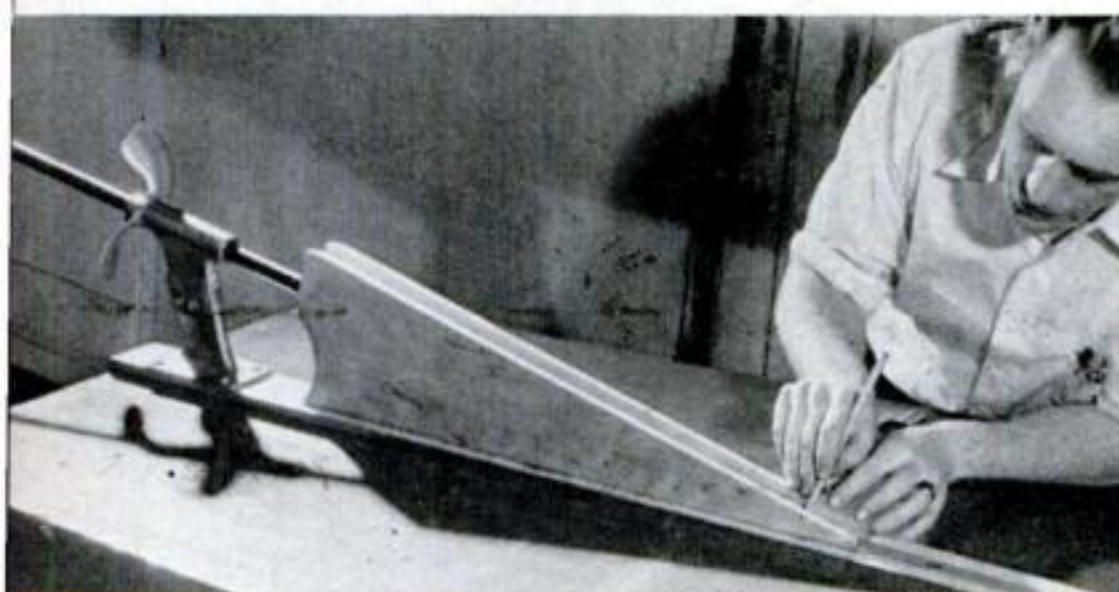


build a doghouse—well ventilated but adequate to keep water off the engine. Then, too, he might want a generator and battery for the running lights needed on Federal waterways.

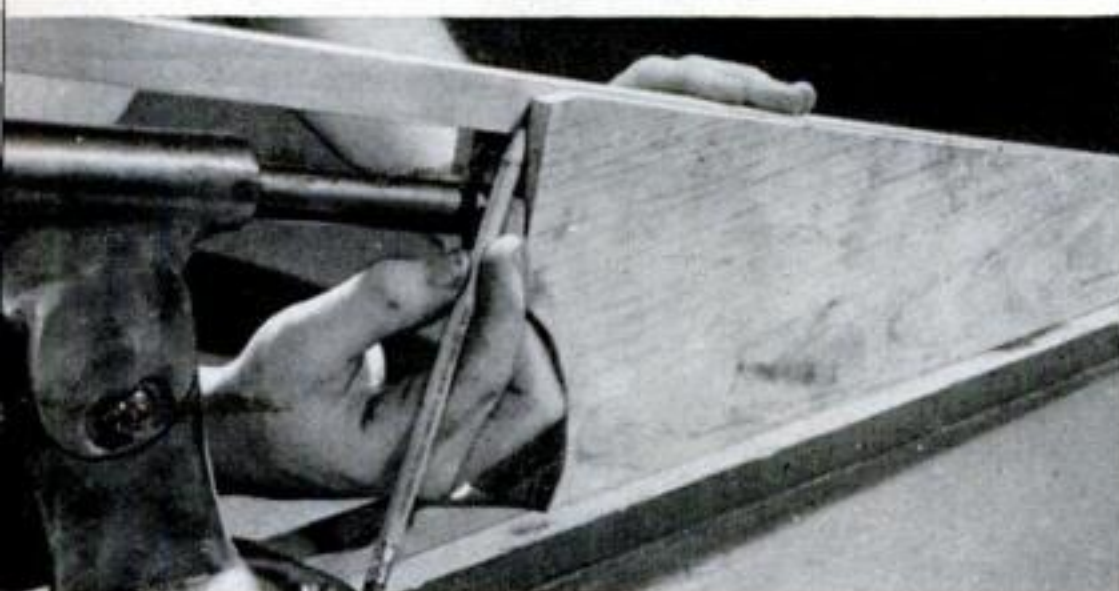
If I had built for salt water, I would have used: all brass screws, bronze or stainless-steel bolts and fittings in the engine mounts, and a fully enclosed and sealed throttle-

control cable to prevent corrosion and the resulting sticking. I might even go for fresh-water tanks under the seats and an underwater exhaust.

With an inboard engine installed, you must register your craft with the Coast Guard. You'll also want a copy of the regulations—the Coast Guard supplies it—governing your craft.

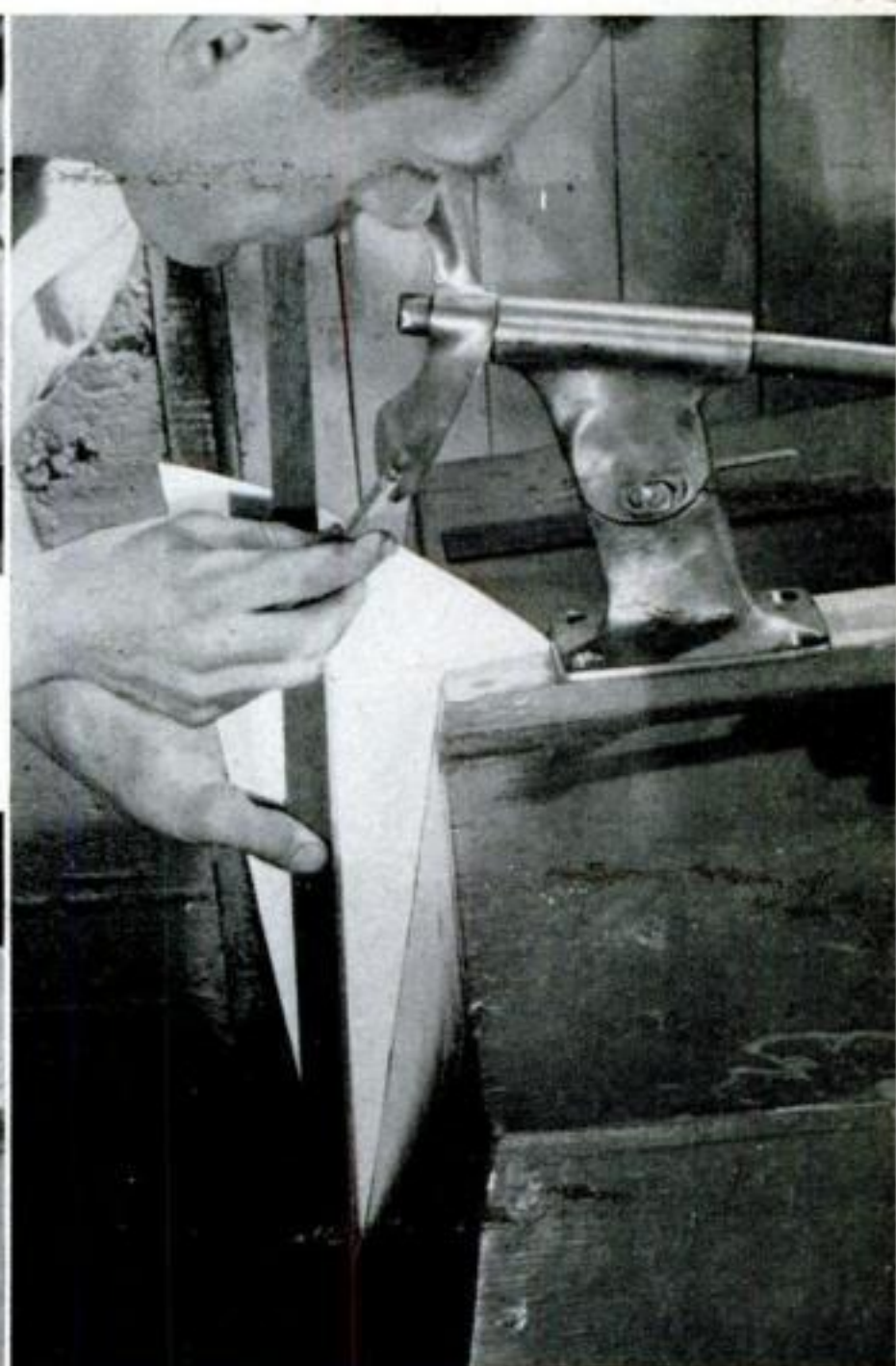
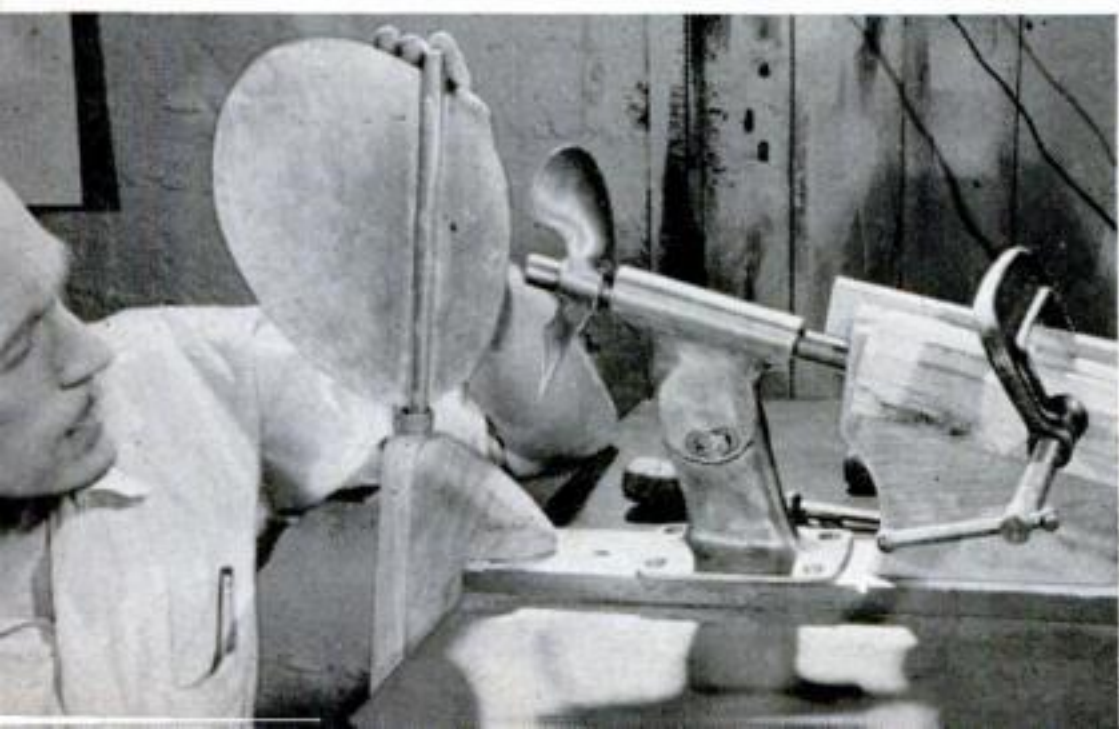


8 SHAFT LINE-UP. With rear strut and deadwood setting the angle, line up propeller shaft. Then mark location of hole through keel for shaft at forward end of deadwood.



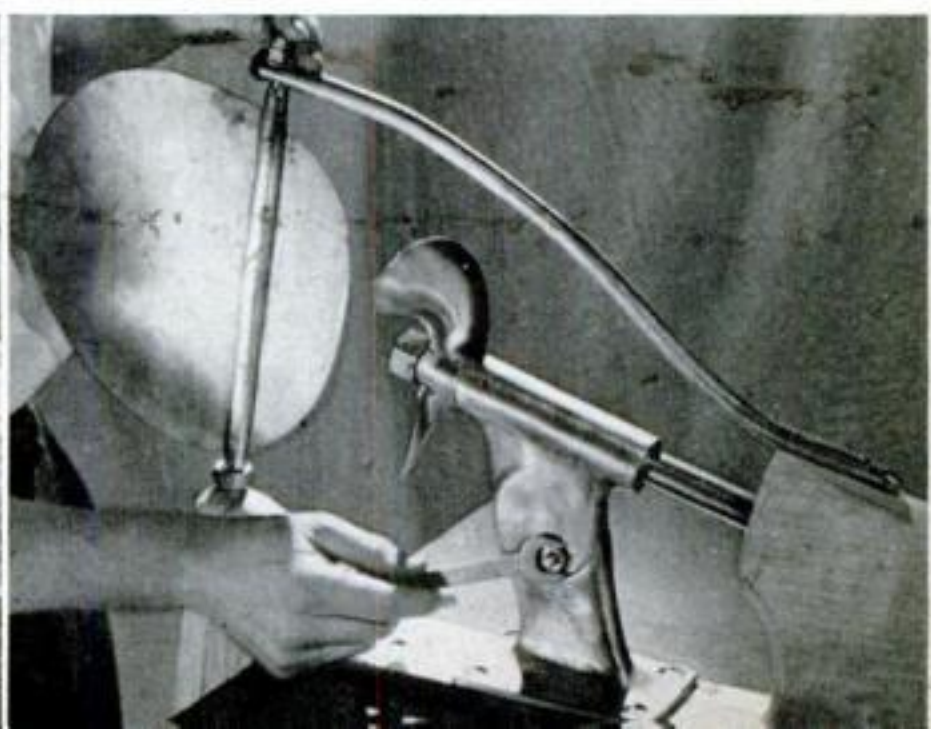
10 FILLER STRIP. Fasten deadwood to keel with marine glue and with screws from inside boat. Close slot with filler strip. Fasten filler strip with glue and brass screws.

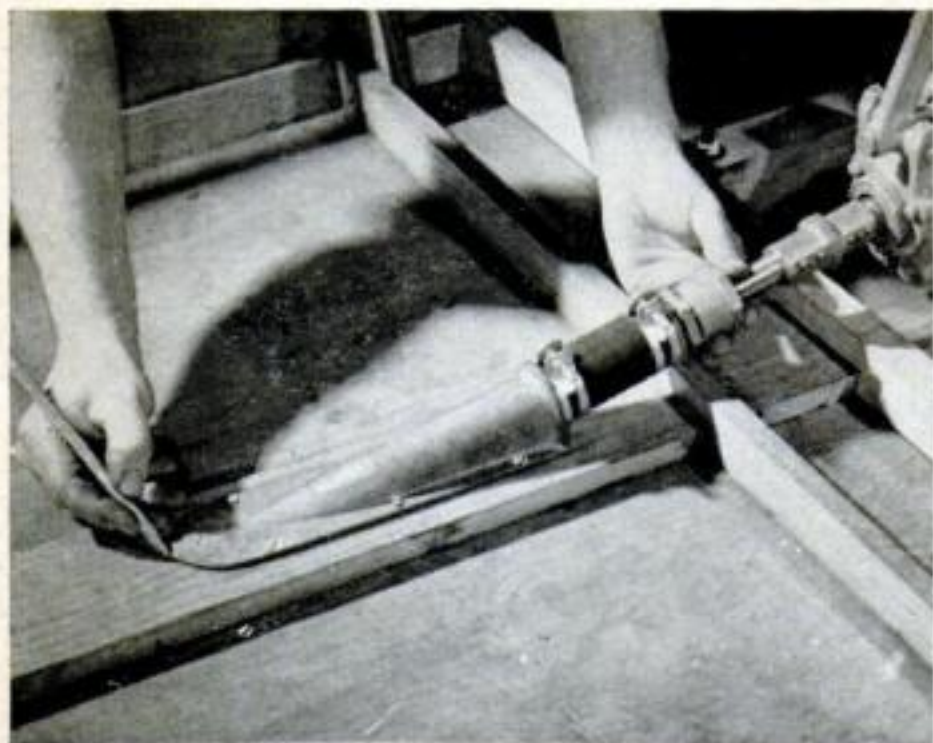
13 RUDDER. You can cut this from .050" steel (below) or $\frac{3}{4}$ " or $\frac{5}{8}$ " marine plywood. Align accurately on same center as shaft. Metal rudder is riveted in split post with about one-fifth of rudder ahead of post.



11 RUDDER POST. Make cardboard template to work out size and shape of rudder post. Be sure to locate post so propeller can be removed without unshipping the rudder.

14 SKEG. This is nautical equivalent of tail skid. It protects screw and rudder if boat is run aground. Bend it from $\frac{1}{2}$ " cold-rolled steel. Braze threaded stud in bottom of split rudder post. *(Continued on next page)*

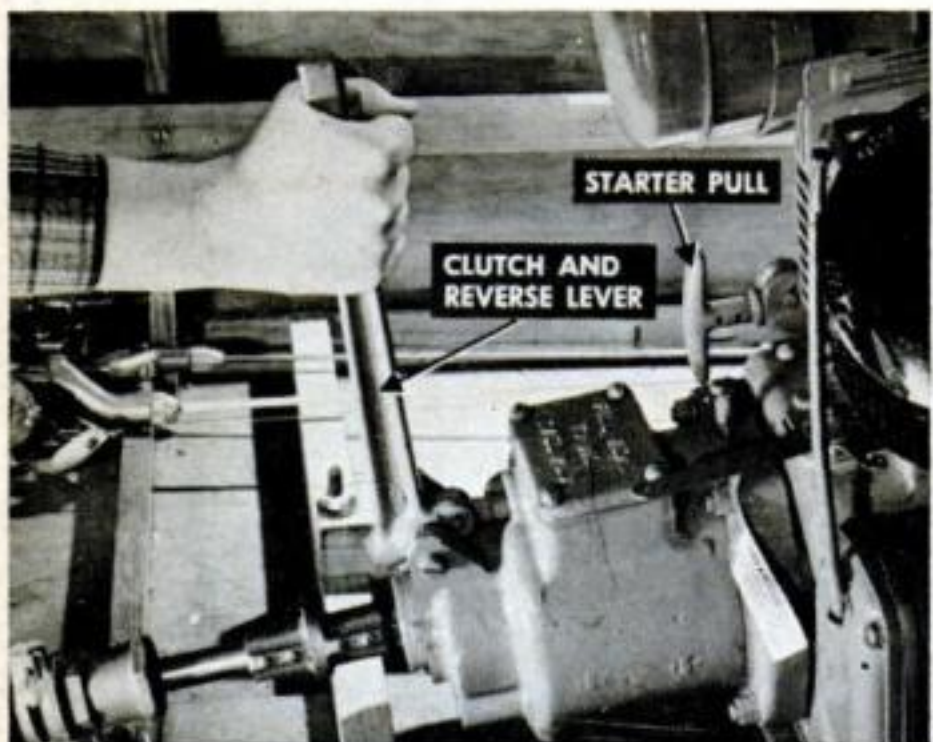




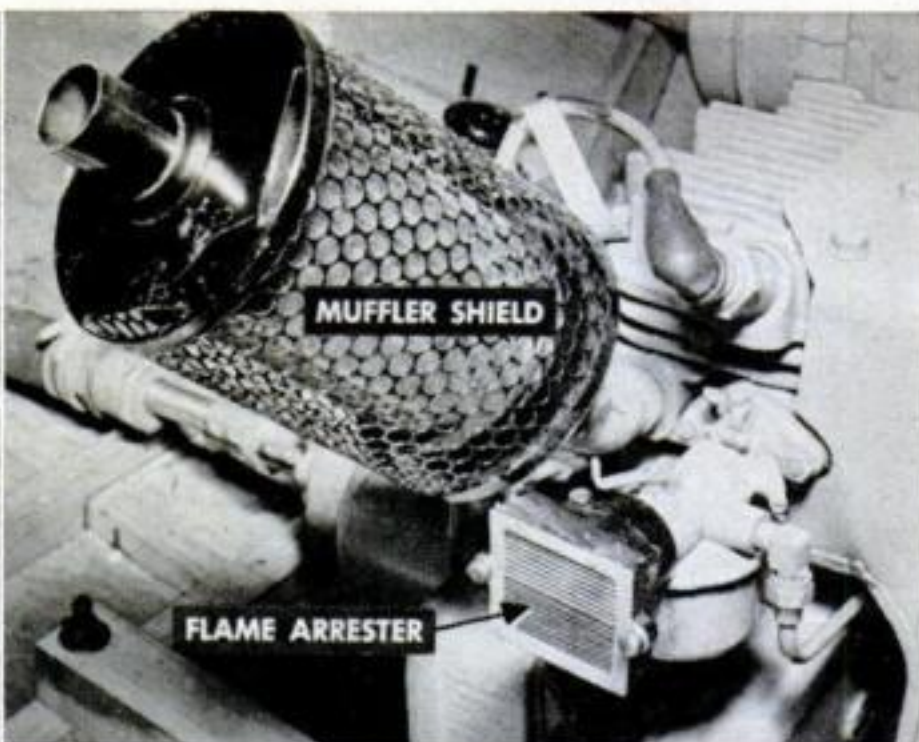
15 SHAFT LOG. Locate log where shaft will spin freely in bearing. Leave packing out of log and key out of shaft so you can spin shaft with fingers to make this location check.



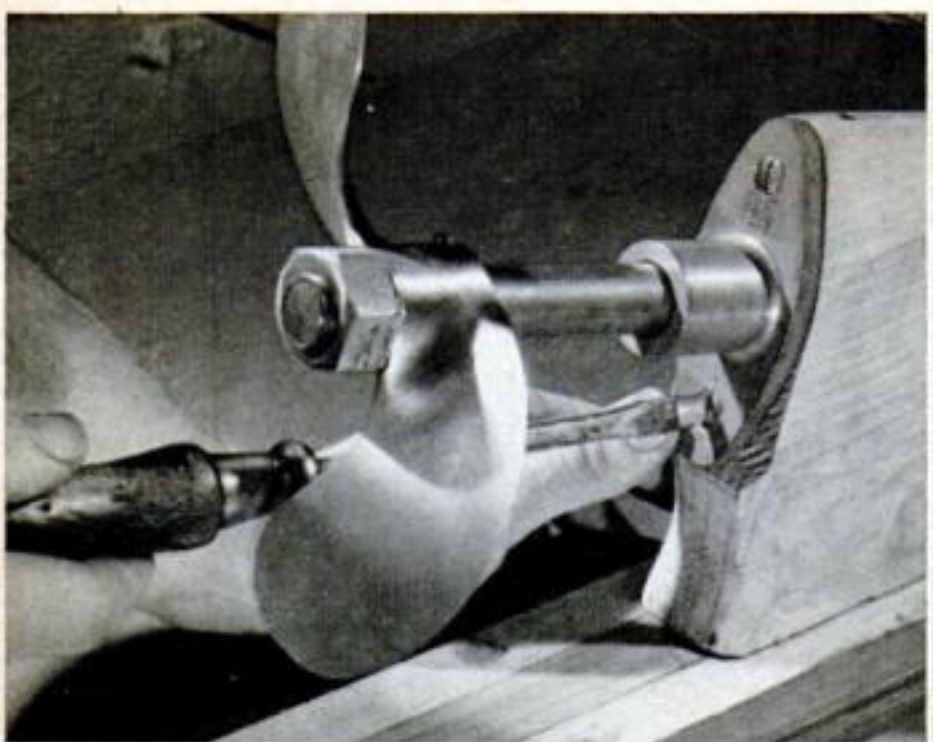
16 SHAFT-LOG SEAL. Cut canvas gasket for shaft log and soak gasket in paint. Smear thick marine paint around opening before screwing down log. Don't overtighten screws.



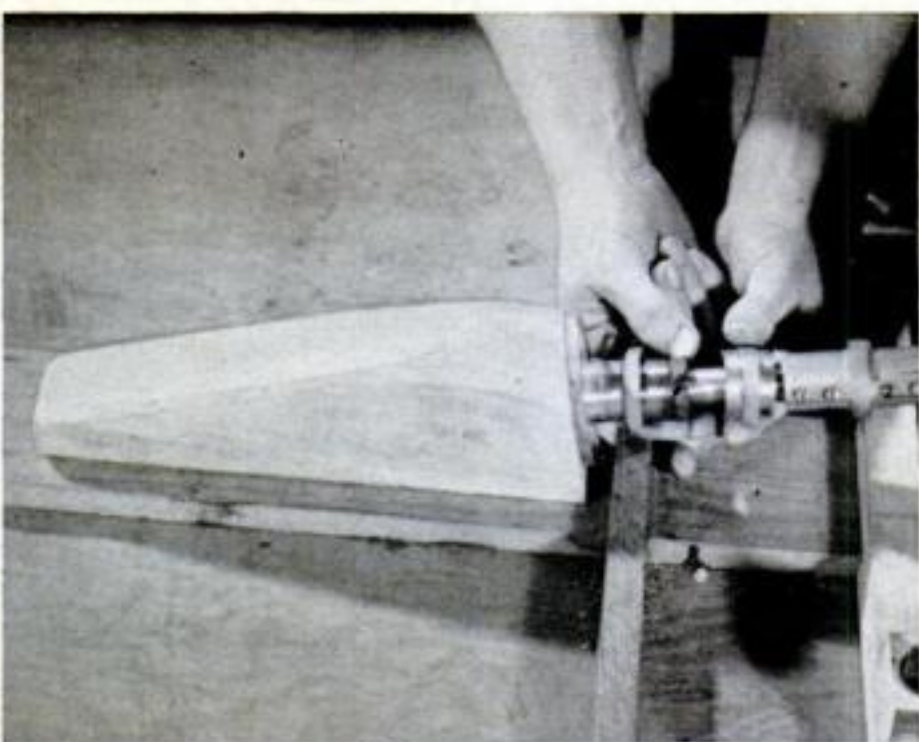
17 REVERSE GEAR. Rugged unit has constant-mesh gears and thrust bearing to take push of propeller. Clutches, simple cone type, are readily adjustable. Unit is shown in neutral.



18 MUFFLER SHIELD. This is protection against burns if you should brush against hot exhaust. Flame arrester is required on all engines used in boats on Federal waterways.



ALTERNATE SHAFT MOUNTINGS. A simple rear bearing like the one at left above costs much less than adjustable rear strut, but cannot be realigned without removing and trimming



deadwood. To go with the plain rear bearing, a seal and front bearing were combined in this wooden block (right above). This eliminates the need for the regular shaft log. **END**

Are You Saving PSM Data Cards?

HOME and shop problems are a cinch to solve if you have a file of PSM data cards near your workbench. During recent years, information on hundreds of subjects—from the sizes of nails to servicing an electric dishwasher (below)—has been published

on these handy data cards. The cards are always printed the same size—just right for pasting on 3" by 5" file cards. Start a file now with the two cards printed on this page. Then you will have this and other valuable information always on hand when you need it.

ELECTRIC DISHWASHER

If it does not wash satisfactorily, the dishes may not have been precleaned properly or loaded correctly. If ordinary soap is used, the dishwasher may not do a good job. The proper type and amount of detergent must be used. Incorrect water temperature may also cause washing failure.

If enough water does not accumulate, the signal or outlet-valve solenoid may be defective, or a defective valve may be letting the water drain away.

If water drains slowly, the drain valve may not be opening sufficiently or the plumbing line may be partly closed.

If dishwasher is noisy, the motor may be out of alignment. An impeller or spray nozzle that is loose or out of alignment will also cause noise. A bent dish rack may

touch the rotating impeller or nozzle. Worn or dry bearings are another cause of noise.

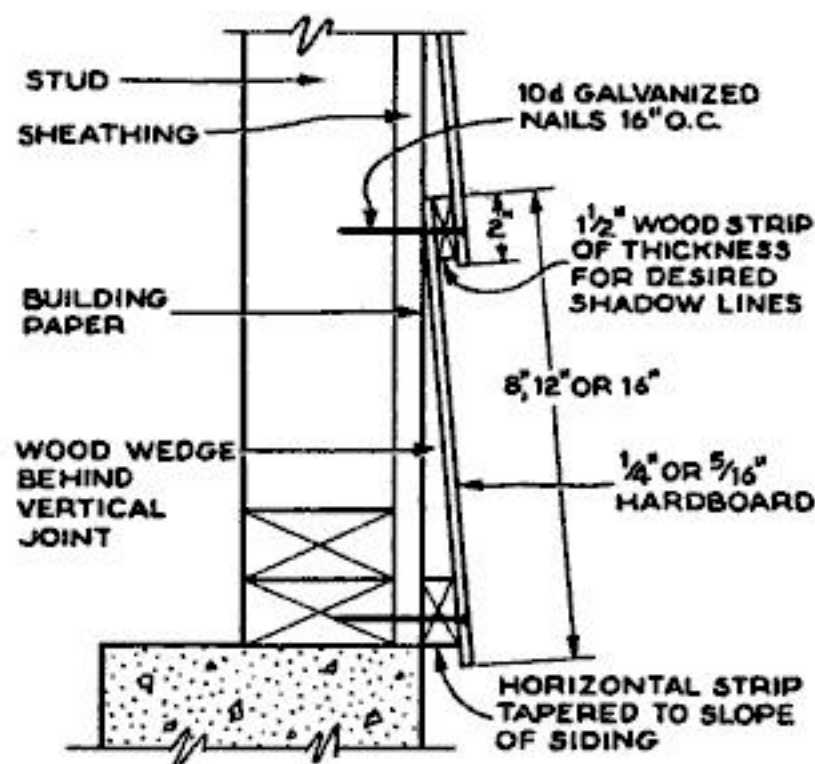
If automatic dishwasher does not follow proper operating cycle, the automatic timer is defective, the wiring is incorrect, or else the control solenoid or relay is not operating properly. This trouble is almost always electrical.

If the door leaks, the gasket is either loose or worn.

If washer will not run, the circuit is open in the unit, the cord or the plug. First check the outlet itself to make sure the house circuit is okay. The open could be due to a defective switch or timer, or to broken leads or loose connections. (From *Electrical Appliance Servicing*, by William H. Crouse.)

FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE

HARDBOARD LAP SIDING



FOR YOUR POPULAR SCIENCE MONTHLY INFORMATION FILE

Hard-surfaced composition board in widths of 8", 12" or 16" can be used as lap siding. It is strong, durable and weather-resistant, and holds paint well. Either 1/4" or 5/16" tempered hardboard is recommended by the Masonite Corp. Before applying, thoroughly wet hardboard siding by scrubbing the back with cold water and a stiff broom. Wet it until it turns a dark chocolate brown. Stack the siding back to back, cover it with a tarp and let it stand at least 24 hours before use. Apply the siding while it is moist. Wetting is necessary so that the siding won't expand and buckle when it is rained on after it has been nailed to the sheathing. Only paints suitable for exterior use on wood should be used—a prime coat and then two additional coats.



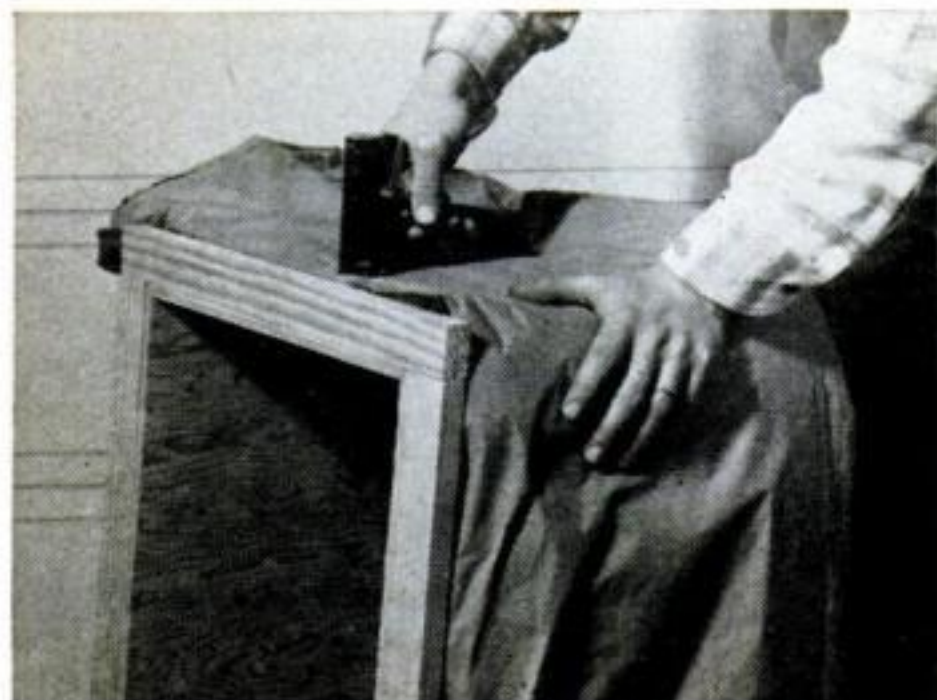
Building an

It does double duty—as an icebox to take on picnics and as a storage box for foods when you defrost the freezer.

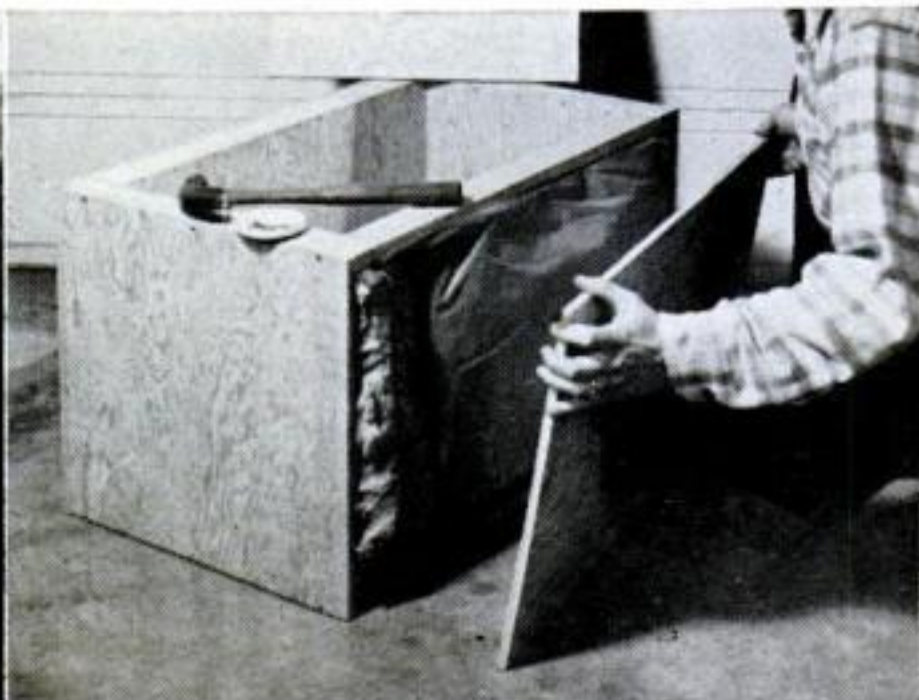
PACK drinks and sandwiches in this box and you're ready for a picnic. A little dry ice in the box will keep drinks cold and food fresh for a long time. The secret is insulation—2" of mineral wool on all sides and in the lid.

When it is not doing duty as an outdoor ice chest, you can use the insulated box in your home. Store frozen foods in it while you defrost your freezer or refrigerator; the food packages will stay firm and fresh until defrosting is finished.

Construction. Actually, this portable cooler is two boxes—one inside the other. Build the inner box first, joining the parts with 1¼" flathead, nickel-plated wood



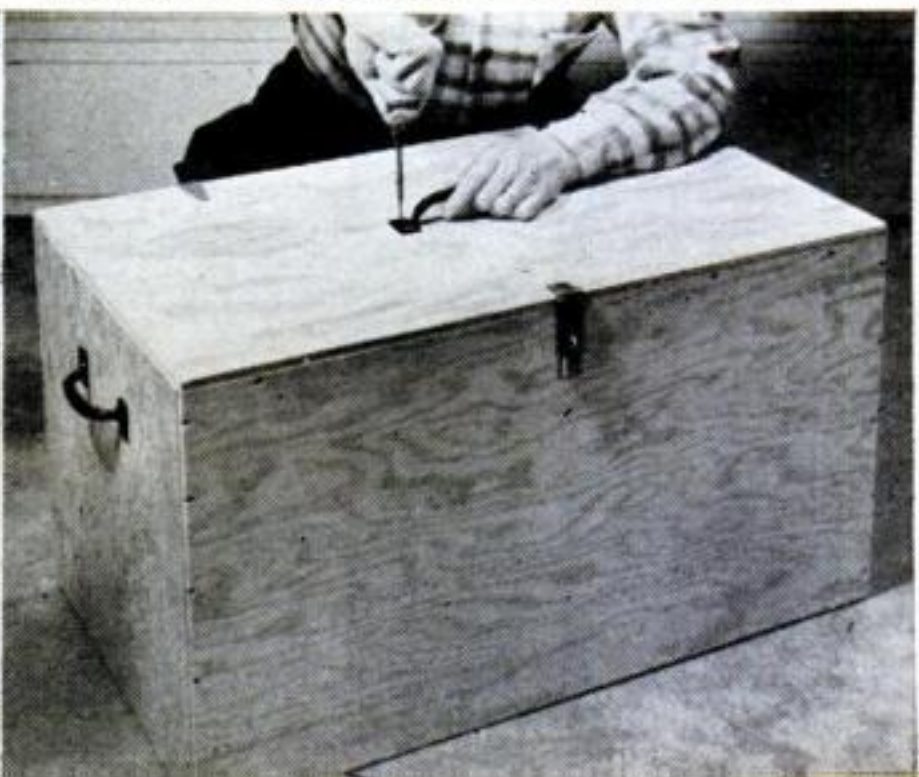
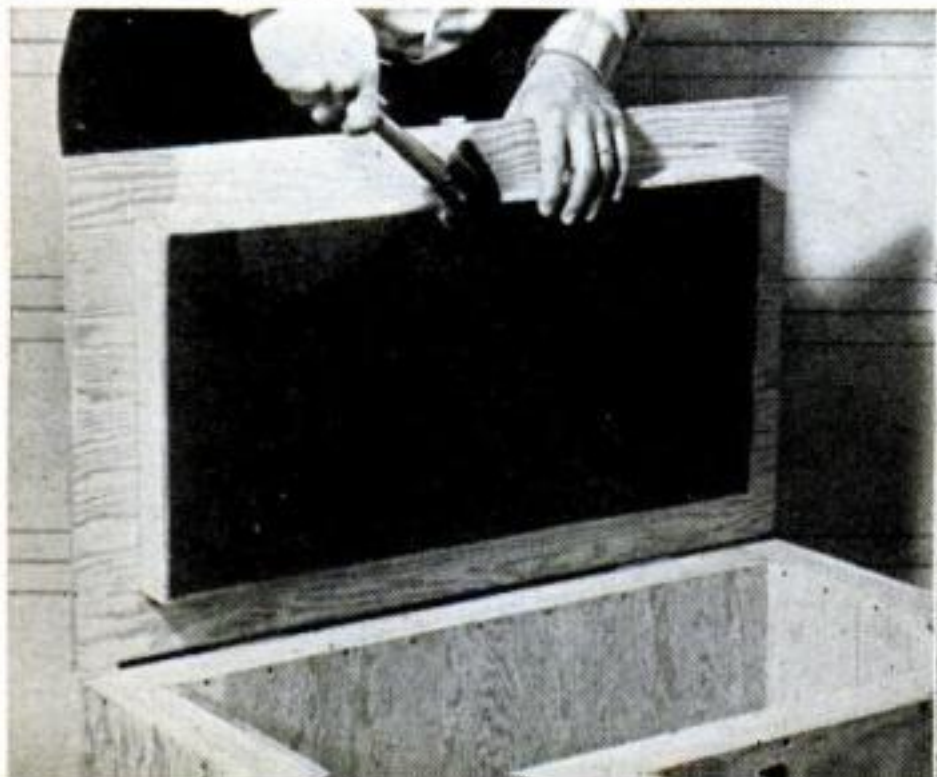
INNER BOX. Brad ¾" plywood parts together. Draw brads singly and replace with 1¼" screws. Cover inner box with 2" batts.



OUTER BOX. After stapling batts to inner box, build outer box around it. One-by-twos serve as spacers between two plywood walls.

LID CONSTRUCTION. Rectangle of one-by-twos forms part of lid that fits inside box. Put insulation in lid, cover with ½" hardboard.

HARDWARE. Use heavy-duty handles on top and at each end. You may want to lift box when it is loaded with food and drinks.

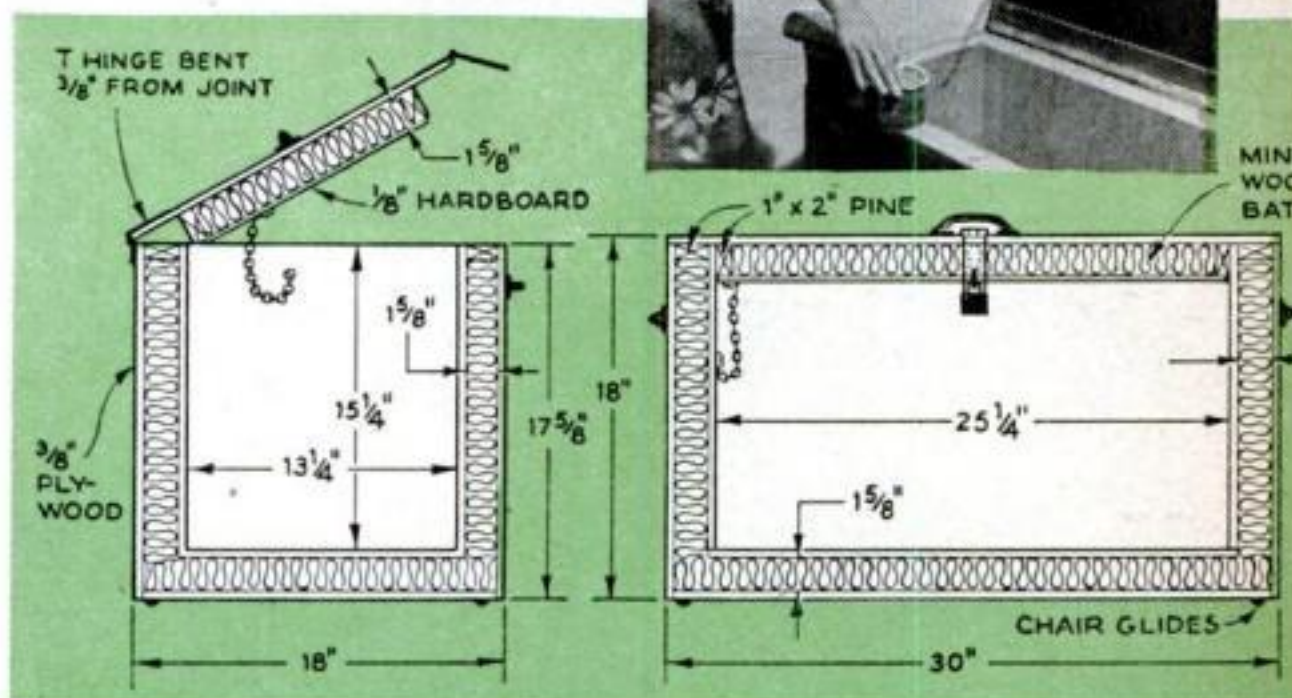


Insulated Picnic Box

screws. Assembly is easier if you brad two panels together, drive the screws and then draw the brads. Rim the top with the one-by-two spacers and staple the insulation in place. Use 15"-wide mineral-wool batts. Then screw the parts of the outer box together and to the one-by-twos.

Lid construction. Fit the top and mark the insulated offset that will fit into the box as the top is closed. Attach a rectangle of one-by-twos to the lid and pack the space with insulation. Cover this insulation with $\frac{1}{8}$ " hardboard.

Bend a pair of T hinges at 90° $\frac{3}{8}$ " from the joint. Screw them to the lid first. Put the lid in position and sit on it—to make a tight fit—



while screwing the hinges to the box. Add a hasp to the box and a chain inside to keep the lid from tipping back too far. Three handles complete the hardware.—*Carlton Strickland, Roanoke, Va.*

Friction Chuck Turns Disks

THE next time you have to turn a quantity of disks, try this sandpaper dodge to avoid mounting flat work on a faceplate. You'll save time and trouble—and avoid those deep screw holes.

Attach a single driving disk to the faceplate and turn it to a diameter slightly smaller than the required turnings. To this, glue a disk of coarse sandpaper.

Scribe circles of the desired diameter on the material and bandsaw the turning blanks, preserving the center marks.

To turn the blanks to size, press the center mark against the tailstock center (below), and then bring up the ram until the blank is pressed firmly against the sandpaper-surfaced driving disk. Lock tailstock and set the lathe in motion.—*W. Haase, Hartford, Conn.*

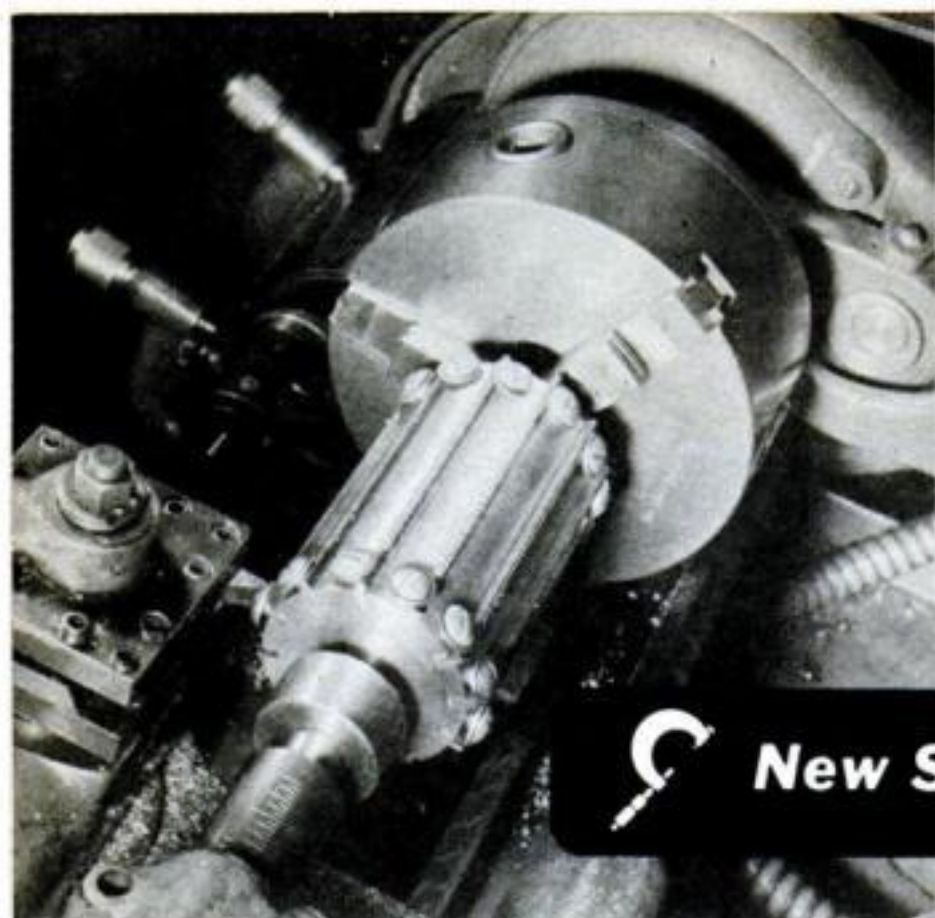


My Most Ingenious Solution



After I had erected my television antenna, I was faced with the problem of getting the lead-in over the peaked top of my house. The roof is hard to climb, and I had no ladder handy. How did I get the wires across?

I borrowed my son's bow and arrow and payed out a length of fishing line from an upstairs window. I tied the line to the arrow and shot them both over the rooftop. Then I tied the lead-in to the fishline and pulled it across.—Paul Sander, Lomita, Calif.

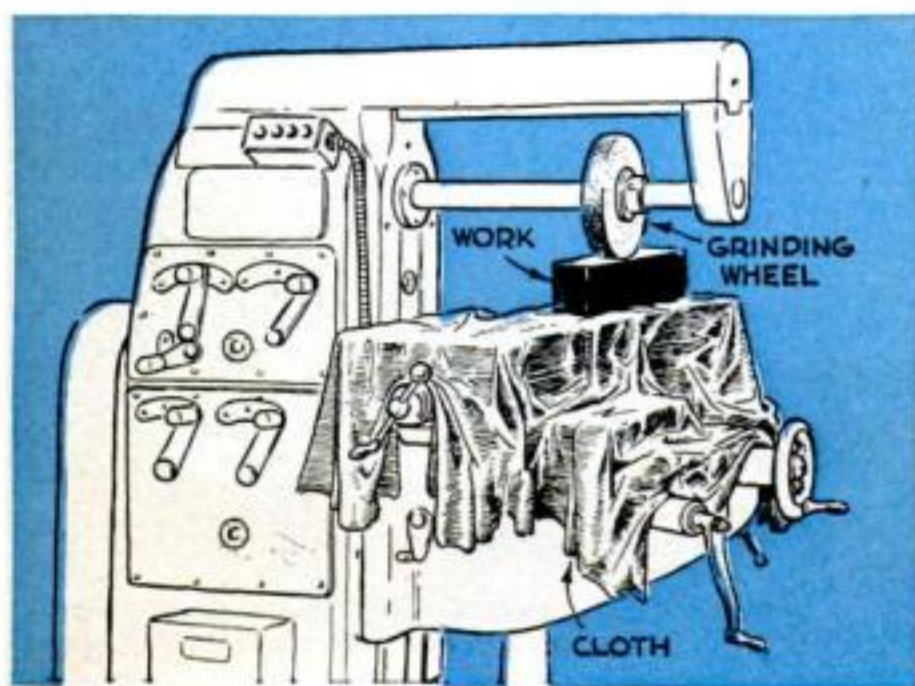


New Shop Ideas

Racks Cut on Lathe. Workable racks for pinions can be cut singly or on a production basis using this setup in a screw-cutting lathe.

Turn the mandrel or holding fixture from 2" cold-rolled steel and cut grooves in it to hold the blank strips. The mandrel illustrated was made to cut 12 racks at once—you need only a single groove for cutting individual racks. Use machine screws and washers at each end to clamp the blanks securely in place.

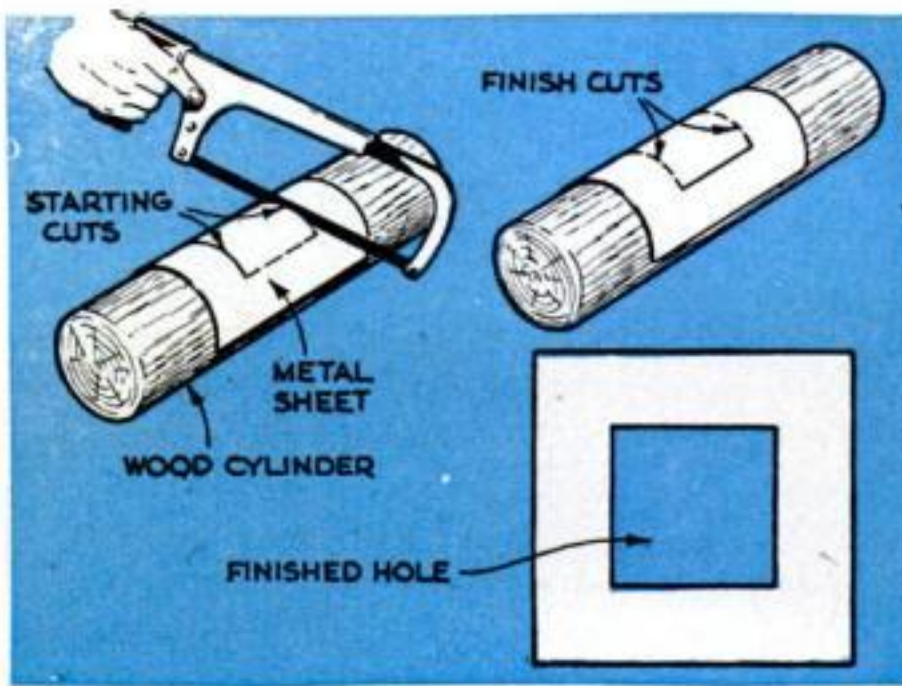
To determine the teeth per inch for a given pinion, roll the pinion firmly on blotting paper and count the tooth depressions per inch. Then set the lathe gears to a corresponding number of threads per inch. Grind the cutting bit to the approximate shape of a pinion tooth, but leave it very slightly larger to provide tooth clearance. Try the pinion as the cutting progresses to determine the depth of cut.—*Floyd McGuckin, Ridgewood, N. J.*



Surface Grinding in a Miller. Your milling machine can pinch-hit as a slow but accurate surface grinder to put a smooth finish on occasional fussy machining jobs.

Mount a grinding wheel on the milling arbor and, using the fastest spindle speed, feed the table back and forth manually. Advance the cross-feed after each lateral pass under the grinding wheel.

Cover the milling table completely with a tightly woven cloth, leaving only the work surface and feed controls exposed.



Cutting Square Holes in Sheet Metal.

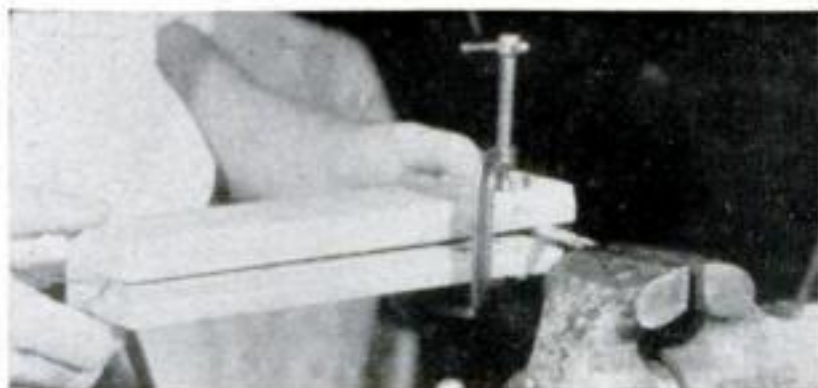
You can use a hacksaw to cut neat rectangular holes in thin sheet metal without having to drill a starting hole by using the dodge shown above.

Bend the material over a wooden cylinder and cut two edges of the rectangle. Give the sheet a quarter turn and bend it over the cylinder again to make the two final cuts.

Use a fine-tooth hacksaw blade to avoid snagging the teeth in the thin metal.—*Hugh Lineback, Stillwater, Okla.*

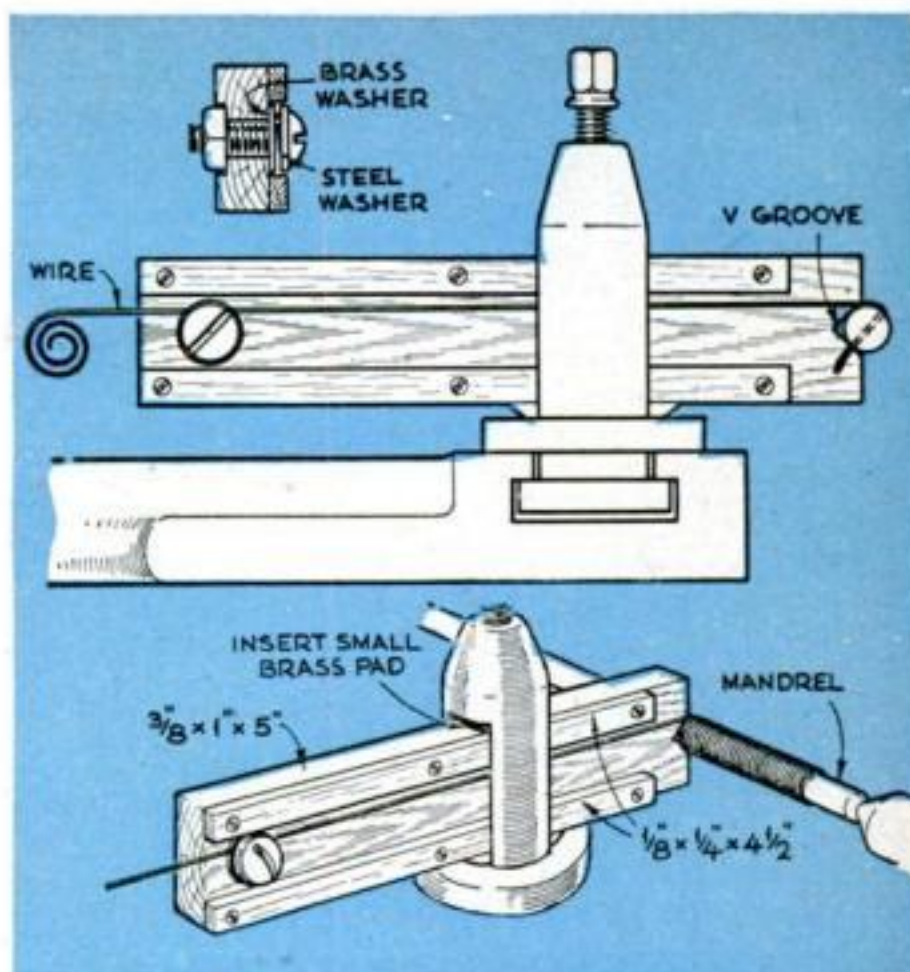
Springs Made to Order. A small stock of music wire, in various sizes, will provide the makings for winding a wide variety of springs.

L. W. Bonnell of Fort Worth suggests an easy method of winding springs by hand. Select a mandrel about 10 percent smaller than the desired inside diameter of the



spring. This can be a nail, a drill shank or a piece of drill rod. Wrap a few turns of wire around the mandrel and clamp it in a vise. Clamp two pieces of wood over the wire and mandrel, as shown above. Rotate the clamped pieces of wood around the mandrel to wind the spring, holding the free end of the wire out at a slight angle to the mandrel to keep the turns tight. Stretch it for use as a compression spring or use it as is for a tension spring.

To wind springs on a lathe, Charles Manson of Columbus has devised a wire-feeding tool with a tension adjustment for making springs really tight (right above). Notch one end of a hardwood block to bear against the mandrel, and screw on two strips of hardwood so that the block will fit snugly in the tool holder and yet provide a clearance channel for the wire. Run the wire between a thin brass washer and a steel washer tightened slightly by a $\frac{1}{8}$ " stove bolt to adjust tension. The thin brass washer distorts under



pressure of the bolt to form a running groove for the wire.

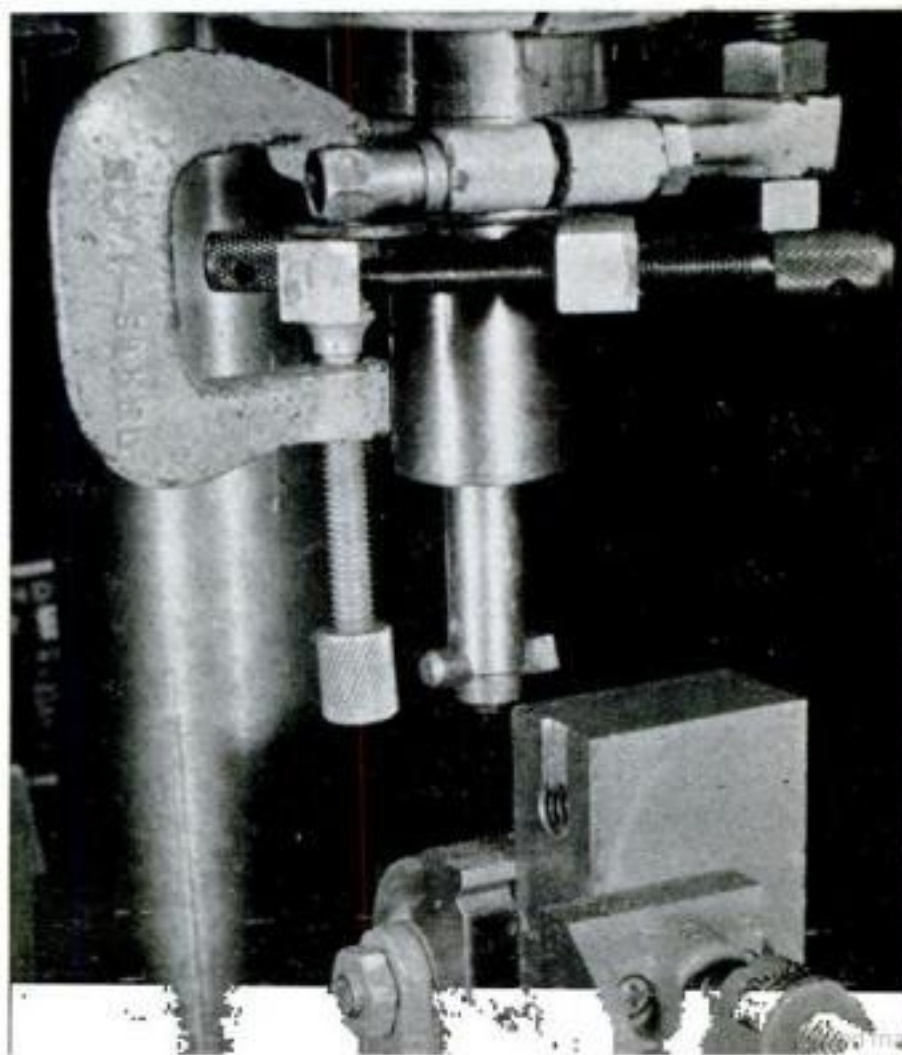
Drive the lathe carriage by the lead screw with the gears set to follow the winding. As an example: .025" wire should wind 40 turns to the inch, but to play it safe and keep the windings from overlapping, set the gears for approximately 36 threads to the inch.

Tension springs need a loop at each end. W. Thomas, Webster, N.Y., bends the spring end over by laying it across a block so that one complete turn overhangs the edge (right). A tap with a hammer bends this turn over to form the loop.



Drill Press as Shaper. Slots and keyways that ordinarily call for a shaper or milling machine can be cut in a pinch with the drill press. This is of course a strain on the feed mechanism but will do no harm if you make light cuts.

Fit a boring bar with a cutter bit ground like a cut-off tool, and chuck it in the drill press. Clamp the spindle as shown so that it cannot rotate, and feed it down against the vise-held work. After each light cut, advance the work a trifle. A milling-table vise is ideal for the work, but you can use a regular drill-press vise that is bolted down, advancing it after each cut by light hammer taps. —Walter E. Burton, Akron.



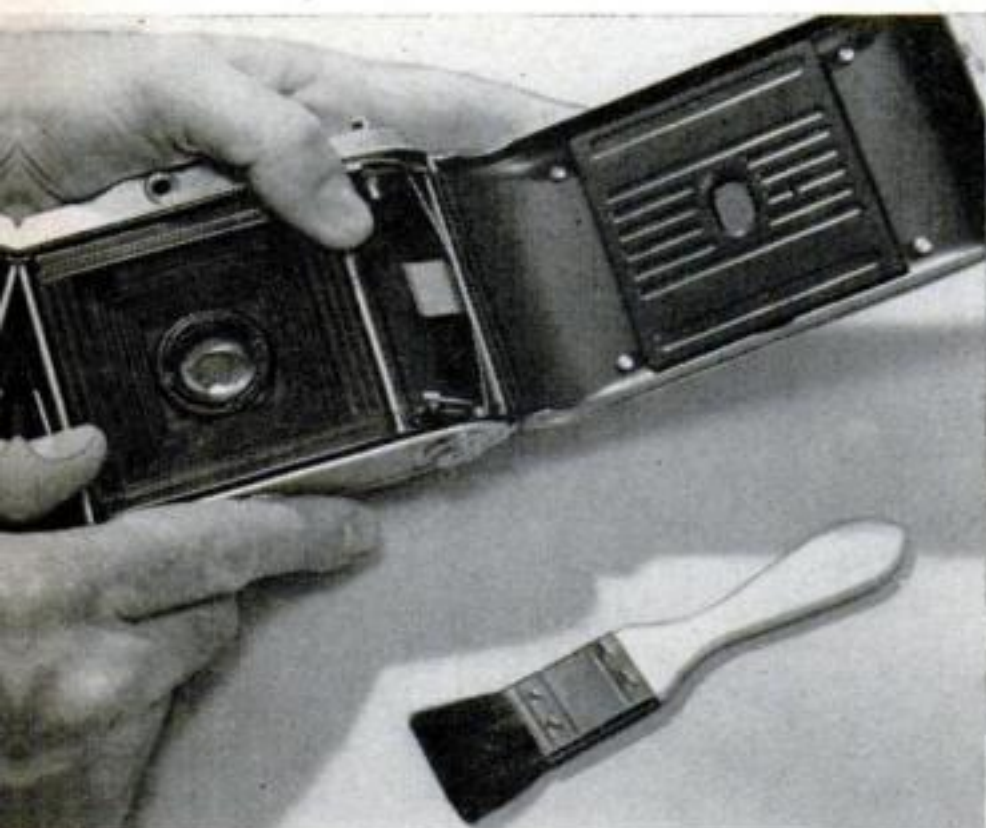


Vacation-Time Camera Check

Buying film isn't the only thing you need to think about for good holiday pictures. A lens smudge or a light leak can ruin every one you take.

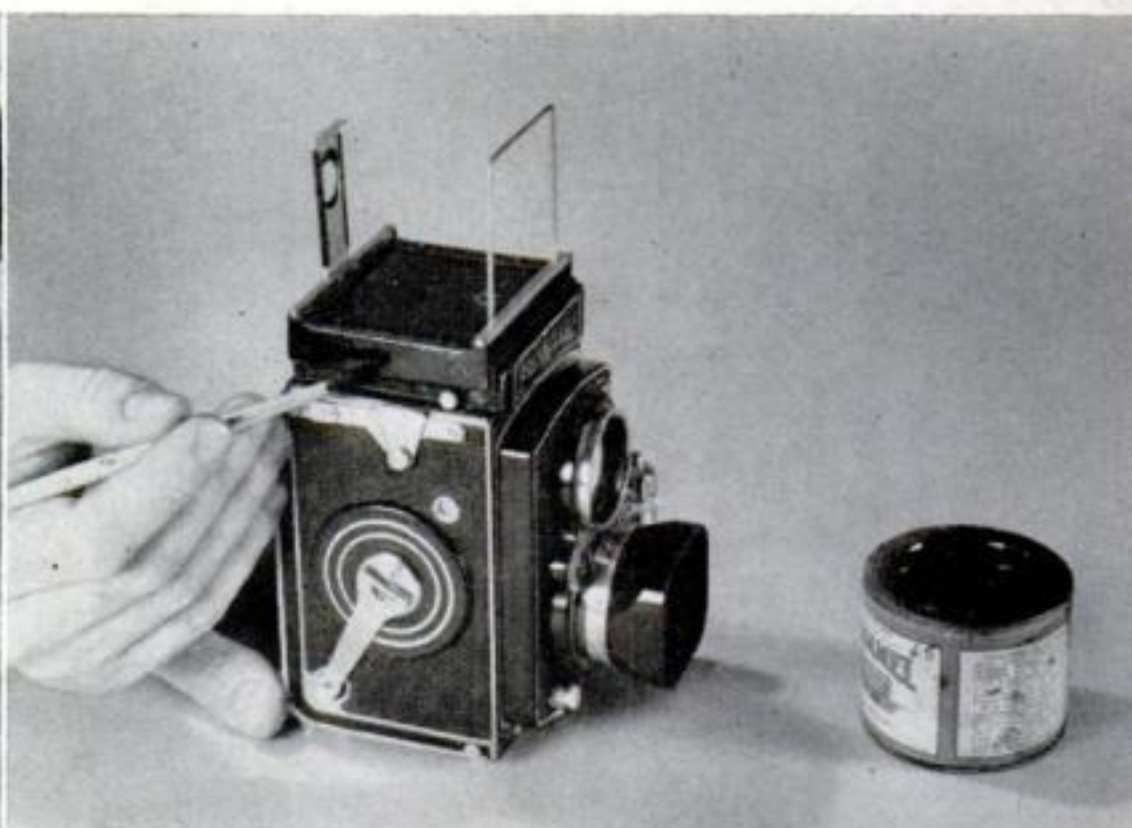


LENS Blow off dust with a syringe, or use a camel's-hair brush. (If wiped with cloth, dust may scratch lens or coating.) Then use tissue and cleaner bought at photo store. Do this even if your lens isn't removable.



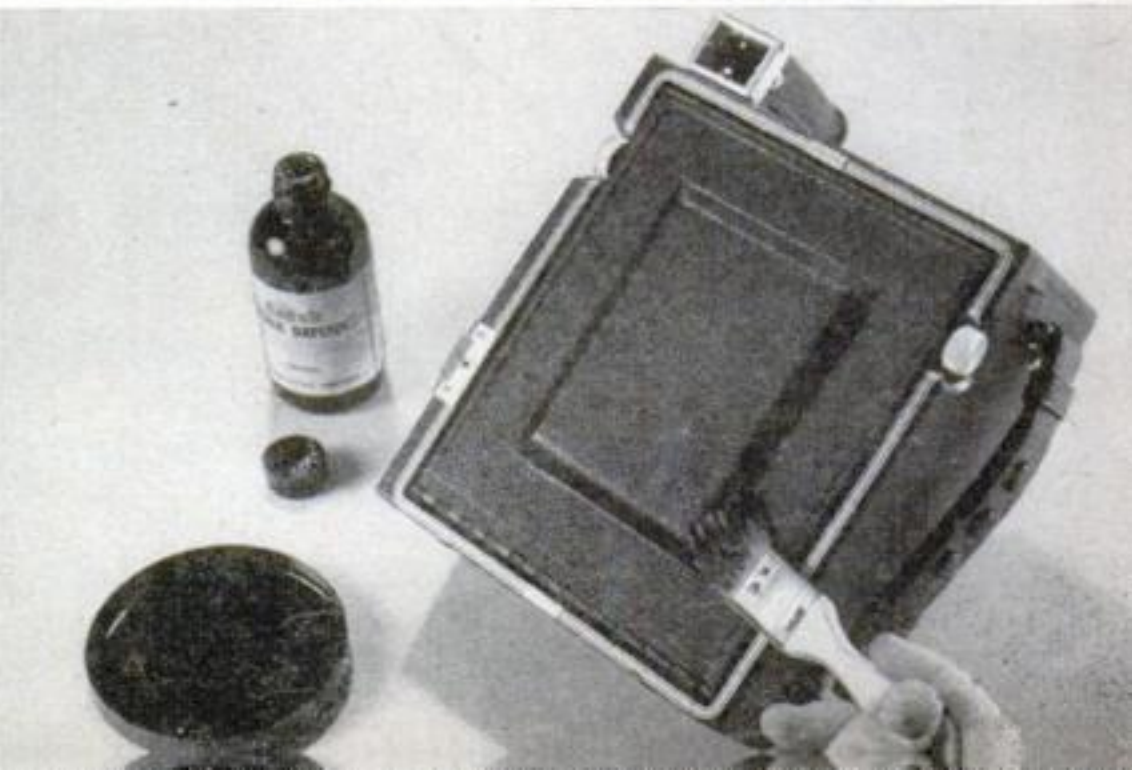
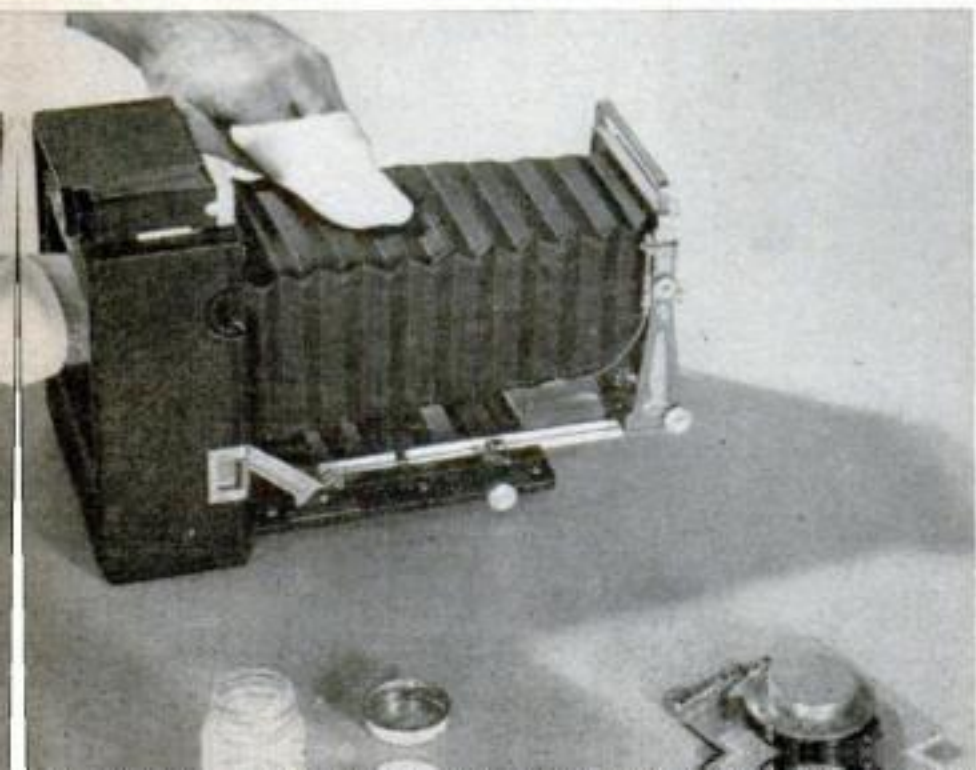
INTERIOR Use soft brush to clean out dust. Be sure film rollers run true and free and that pressure plate has good tension. And don't forget to clean rear surface of lens. A fingerprint can etch lens.

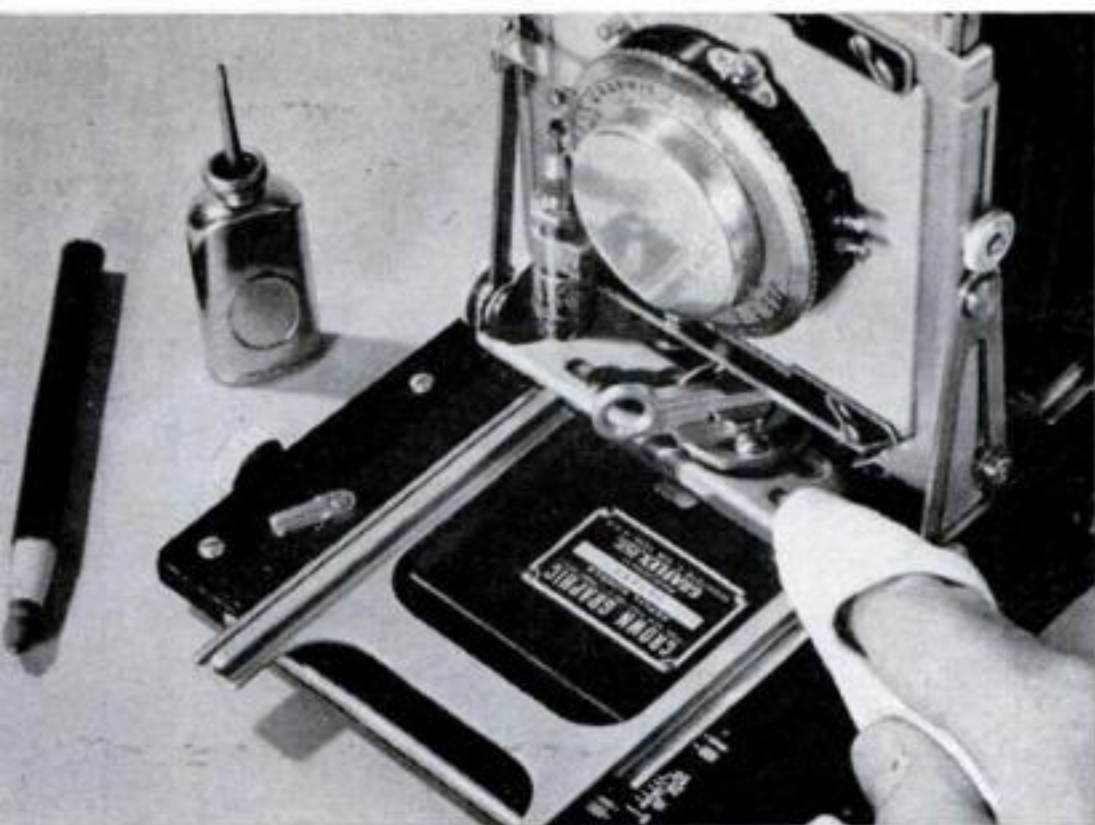
BELLOWS Check for light leaks with flashlight in darkened room. To preserve bellows, apply petroleum jelly sparingly to outside only, and wipe clean.



SCRATCHES Marks on exterior metal can be touched with black enamel to spruce up a camera. Apply several thin coats, letting each one dry completely. On metal inside, use only flat black paint.

LEATHER Dressing applied with brush or wad of cloth will restore luster—and keep your old camera looking new. Fasten loose leather with rubber cement.





BRIGHT METAL This can be protected with a coating of light oil. Apply it with a soft cloth and then remove all you can. A rubber eraser will often remove corrosion. Never lubricate a camera shutter.



ALUMINUM These surfaces can be cleaned with carbon tetrachloride. For a tripod, dampen a cloth in this fluid, rub cloth across paraffin, and wipe on the parts. The wax will act as lubricant.

Vacation-Time Camera Hints

Take care to guard your camera against sand, salt spray and dust.

Do not store it in a car glove compartment. The temperature in there gets too high for anything as delicate as a fine camera or film.

Carry it in a good gadget bag or on a strong strap. Avoid knocks and bumps.

Keep a cap on the lens.

Stifle any temptation toward penknife-and-tackhammer repairs.



May For the poet this is the month of blossoming flowers. For the homeowner it is a time of bright, clear days—and plenty of outdoor work.

- If you have outside painting to do, get it done now before summer insects arrive, and console yourself with the thought that a good paint job should last five or six years. At the same time, inspect masonry for loose mortar, open joints, cracked or loose stucco. Check woodwork for splitting, rotten spots, open connections or joints, sagging or loose pieces. Replace damaged window or door glass. Renew crumbling putty.

- Look over your grounds. Fill any sunken or washed-out spots you find and roll the lawn. Repair gates and outdoor latches and locks. Replace rotten fence posts. Paint fence if necessary. If you have an outdoor grill, make sure it is ready for the cook-outdoors season.

- Inspect your radio and TV antennas and lead-ins to make sure all connections are firm and tight. Open all attic windows or louvers and basement windows for summer ventilation. This helps discourage dry rot and vermin. Check clotheslines. If they are frayed, replace them before one breaks under a wash-day load.



How Did the Birds Get in the Fishbowl?



You might think birds and fish would not mix any better than oil and water, but in this aquarium they live feather to fin. Nor is this a taxidermist's dream; both the tropical fish and the parakeets are alive.

There is no trickery about the picture, which was taken by a PSM photographer. How can fish and fowl live together and like it? See next month's issue of POPULAR SCIENCE MONTHLY for the answer.

Sanding Belt Brushed Clean

ROLLING a circular wire brush over a sanding belt from time to time will keep the belt clean and sharp. The sharp wire ends dig out packed material on a loaded-up belt, and rotation of the brush prevents excessive wear. A scrap of hardwood jigsawed into fork shape holds the brush, which spins loosely on a through bolt.—*Lyell D. Henry, Ames, Iowa.*



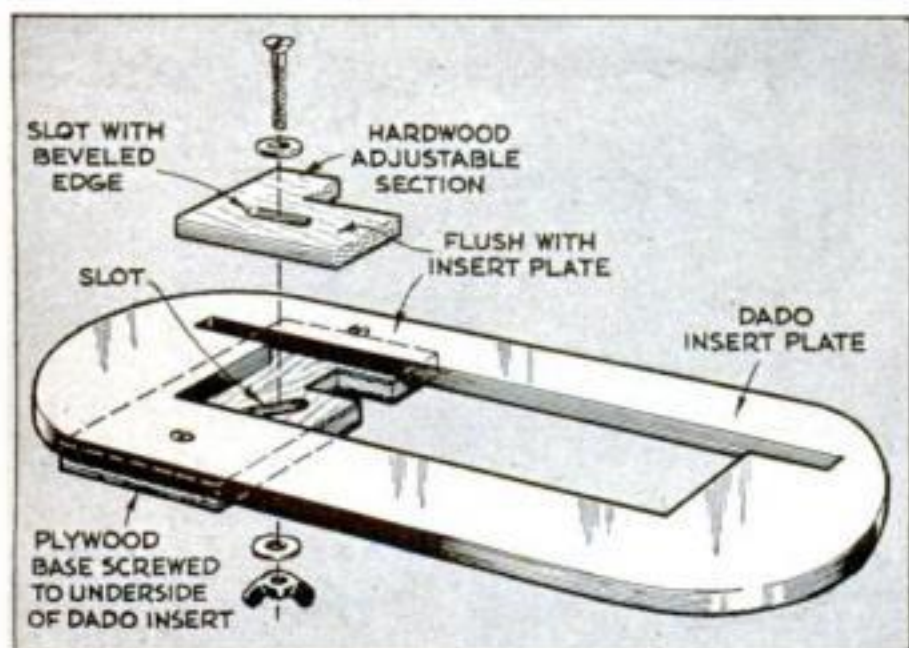
Edge Titles "Index" Magazines



I USUALLY want to keep at least one article in an issue of POPULAR SCIENCE MONTHLY in my future-reference file. Instead of cutting up my copy I label the magazine edge so I can quickly find the one I want.—*Tom Griberg, Moline, Ill.*

Insert Stops Splintering When Dadoes Are Cut on Saw

THIS wooden support, added to the dado insert plate of your table saw, can be set to support work right up to the blade. This



makes it possible to cut clean rabbets or dadoes across the surface grain of fir plywood, and prevents the blade from tearing out splinters. It is adjustable to any combination of dado cutters.

The ½" plywood base, slotted diagonally for the adjusting screw, is attached to the underside of the insert plate with two countersunk wood screws. The hardwood adjustable insert, slotted parallel to the line of cut, rests on the base with its surface flush with the top of the plate. The adjusting screw, with wing nut, rides in the two slots and permits you to move the adjustable section close to the saw blade, regardless of the blade depth-of-cut setting.—*Joseph Williams, Erie, Pa.*

Shop Wall Desk Folds Flat

A drafting board and storage space for plans and drawing tools are built into this compact unit.

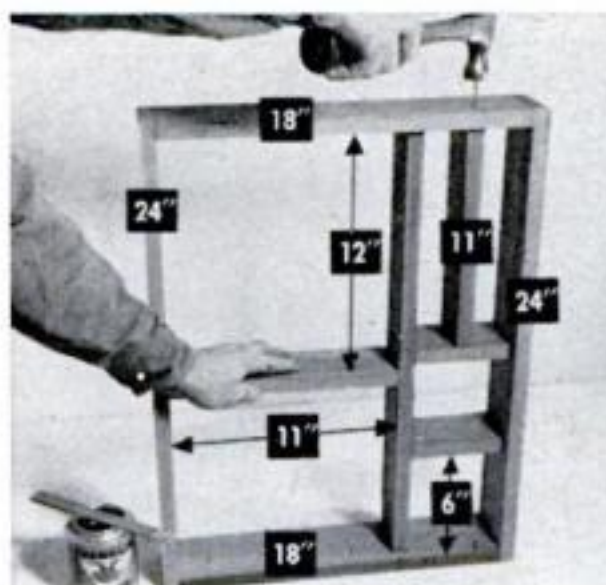


ONE of the handiest tools in my home workshop is my planning center. It's a wall-hung box that stores and organizes notes, drawings, booklets, plans for projects, magazines and my PSM data file.

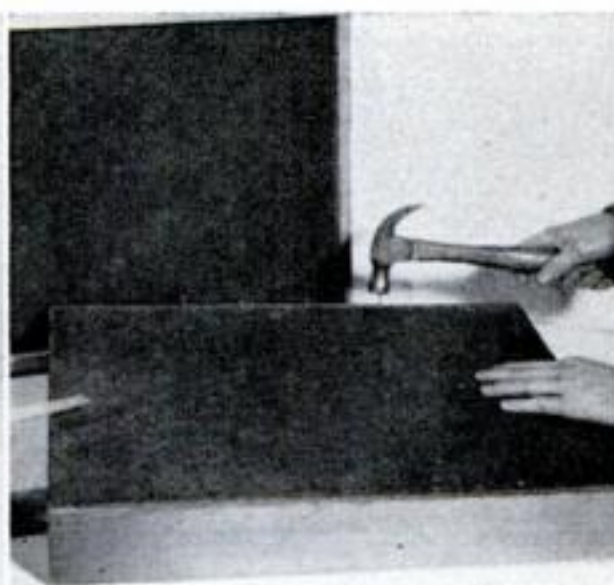
In pigeon holes and in the lid are places for drawing tools and instruments. A flip of the lid converts it into a slanted drawing

board. This is particularly handy, too, for holding plans where I can refer to them while doing a job.

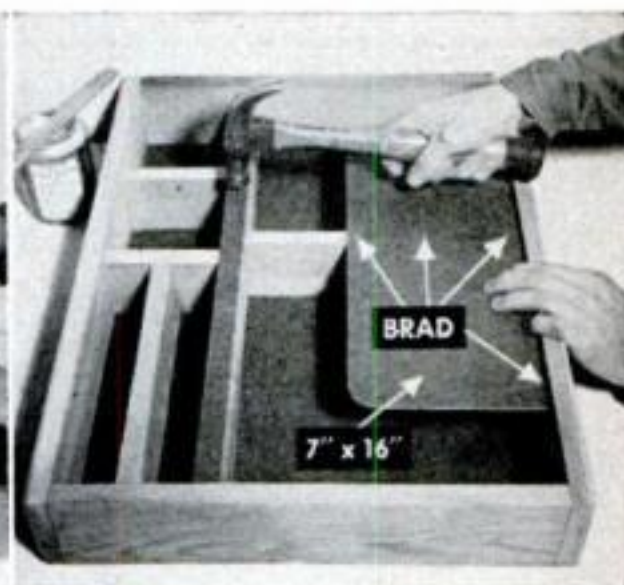
It is a pretty simple piece of shop equipment to build: basically just frames of standard lumber hinged together and covered with hardboard to provide a smooth surface.—Paul Corey, Sonoma, Calif.



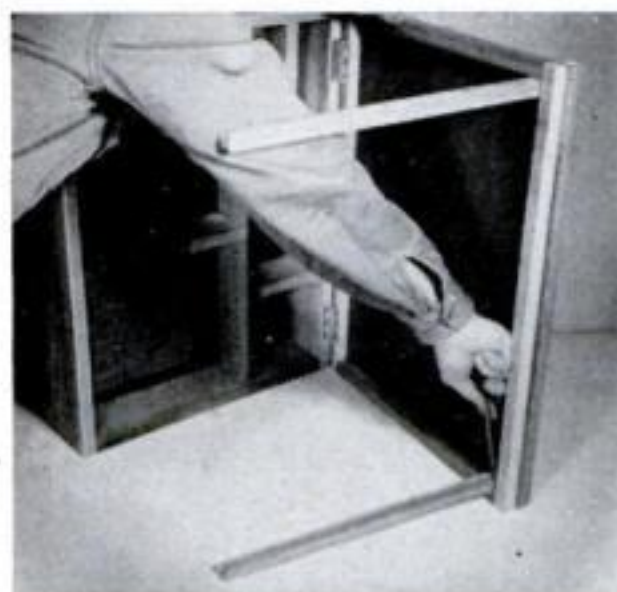
FRAME. Build it of standard 1" by 4" lumber, gluing and nailing the joints. Make partitions $\frac{1}{4}$ " narrower than the frame pieces.



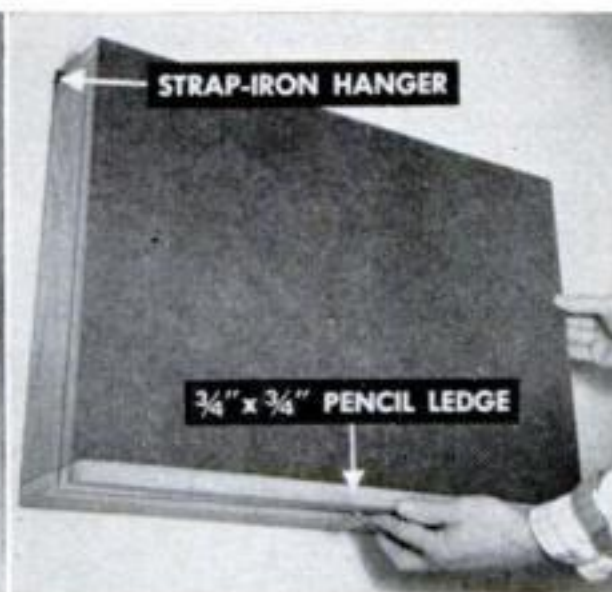
FRAME COVER. Brad $\frac{1}{4}$ " hardboard to one side of the frame. Build a lid of $\frac{3}{4}$ " stock, nailing and gluing it. Cover it with hardboard, too.



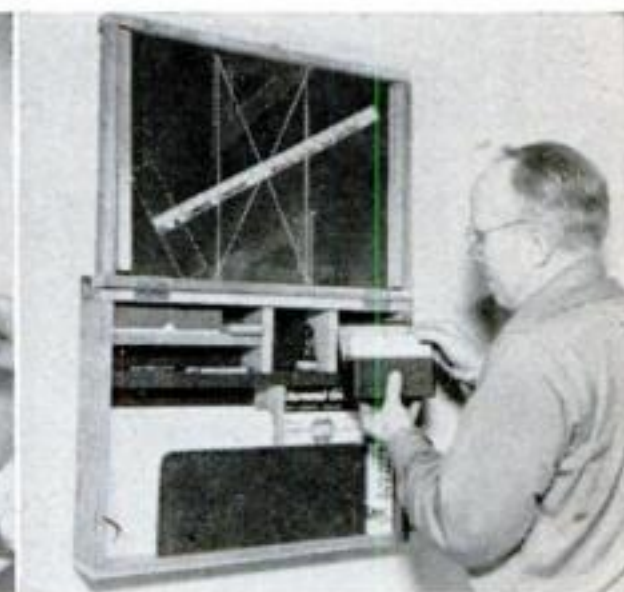
INTERIOR. Edge the long shelf with 1" strip of hardboard to keep pencils from rolling off. Piece of 7" by 16" hardboard holds plans, papers.



ASSEMBLY. Hinge lid to box. Fasten lid props with one screw in each. Props are $\frac{3}{4}$ " square and 16" long. Notch one end of each prop.



MOUNTING. Screw two pieces of strap iron to top of back. Holes in straps slip over nails or hooks in wall. Flat hook holds lid shut.



PLANNING CENTER AT WORK. Rubber bands stretched between eyes hold drawing tools in lid. Compartments hold other instruments.



Putting in an Electric Outlet Yourself

A floor socket keeps cords out of the way and can be installed without cutting plaster or fishing wires through walls.

TO START the day right, you want the morning toast popping up no farther away than your elbow. A floor outlet under the table will bring the toaster, coffee maker or waffle iron right alongside your coffee cup.

You may hesitate to wrestle with kilowatts, feeling that this is a job for experts only. But like burning trash or driving to the drug-store, it's just as safe as your common sense makes it. You can do simple wiring with complete safety both to yourself and your home, once you know how.

But is it legal? It's a big country, and

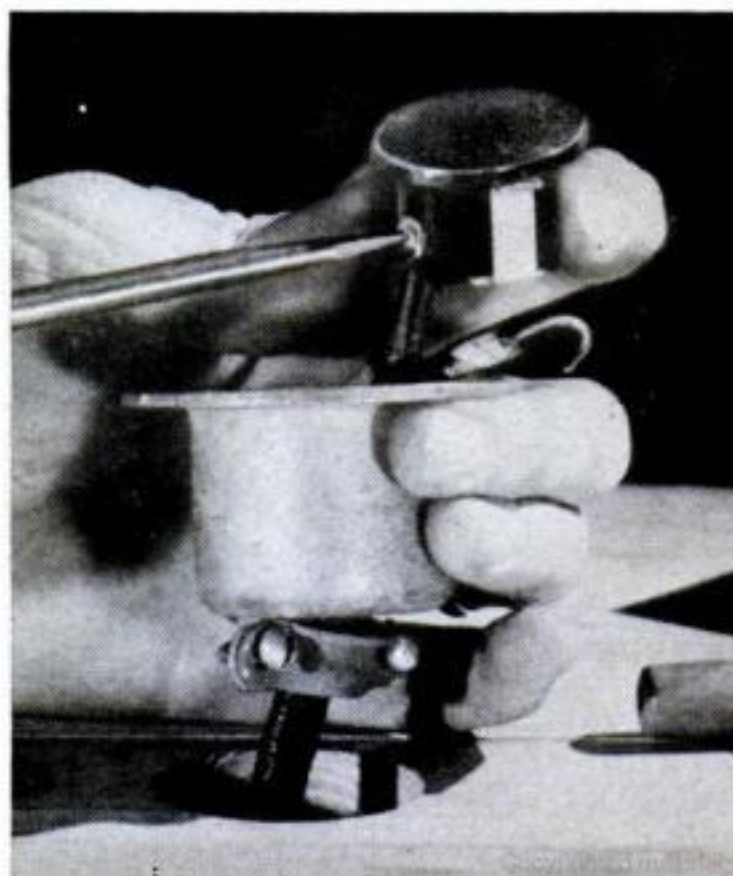
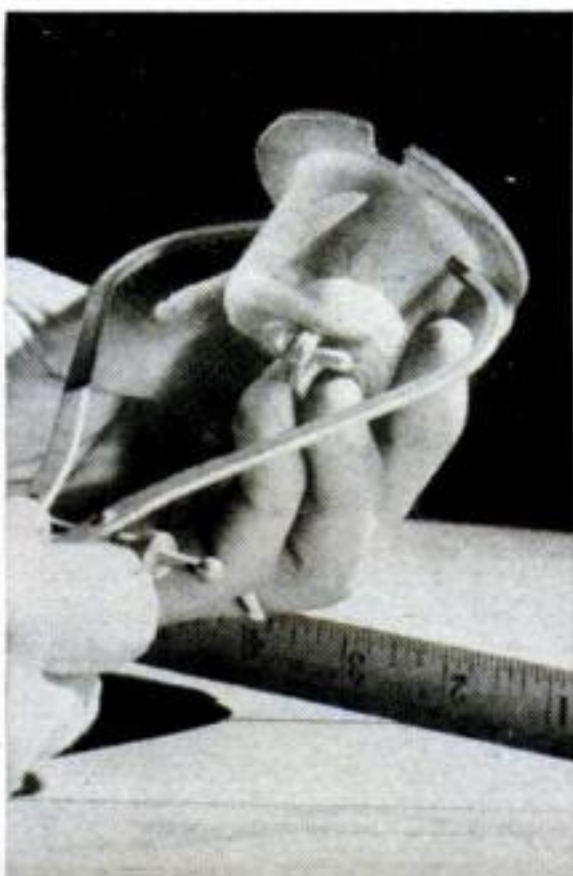
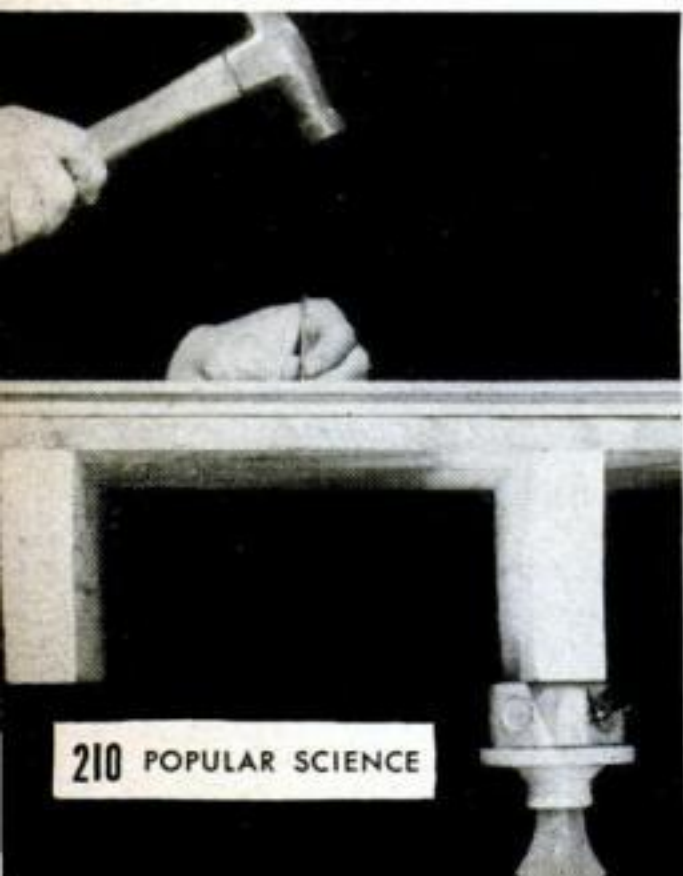
building codes vary from town to town. But it is generally recognized that the homeowner has a right to do such work on his own property so long as he uses approved materials and methods. In some communities, you must get a permit for the job and have an inspector check it when it is done.

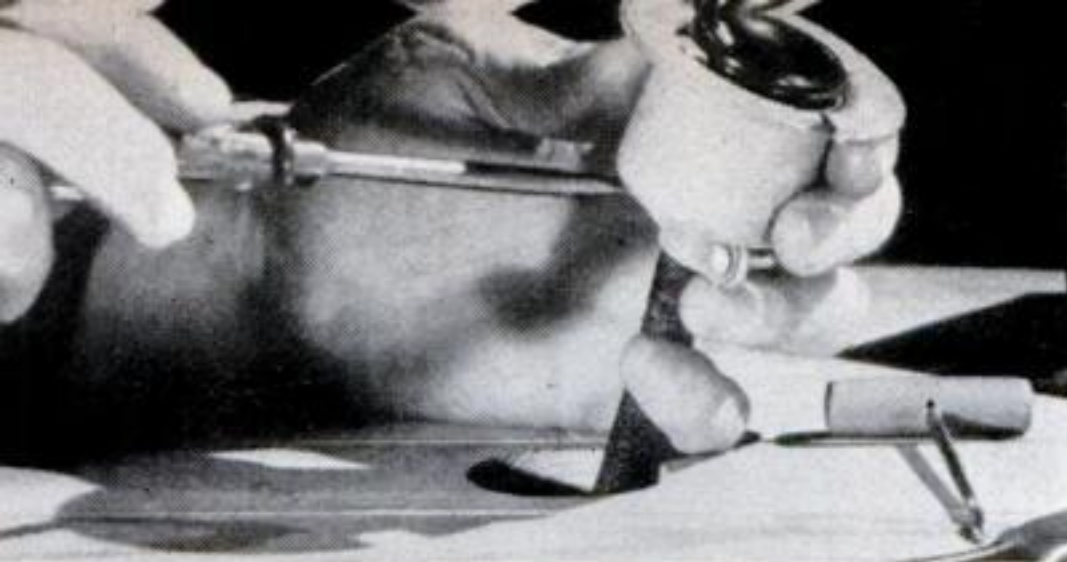
If the work then doesn't comply with regulations, you will have to correct the violations to get an okay. But all this is routine, and if you hired an electrician he would go through the same procedure. Meeting code requirements will assure you that you've

DRIVE A NAIL through floor (or drill a small hole) where receptacle is to go. Push a short wire through to locate hole in cellar. If it's nearer a joist than 1½", outlet box may not clear. Plug hole and try another spot.

MEASURE RECEPTACLE, set expansive bit to the size and bore a trial hole in scrap. The hole should just take the box. This receptacle is an Arrow No. 5016; you can also use a Westinghouse No. 494 or equivalent.

PASS THE CABLE through floor from cellar. Expose wires and strip insulation off ¾" from ends. Push cable through box. Bend white wire clockwise around nickel screw, black wire similarly on brass screw. Tighten well.





TIGHTEN THE SCREWS on connector (cable clamp) at bottom of receptacle box before putting it into hole. Then insert it, fit cover plate over it, and secure plate with flathead screws as at top of facing page.

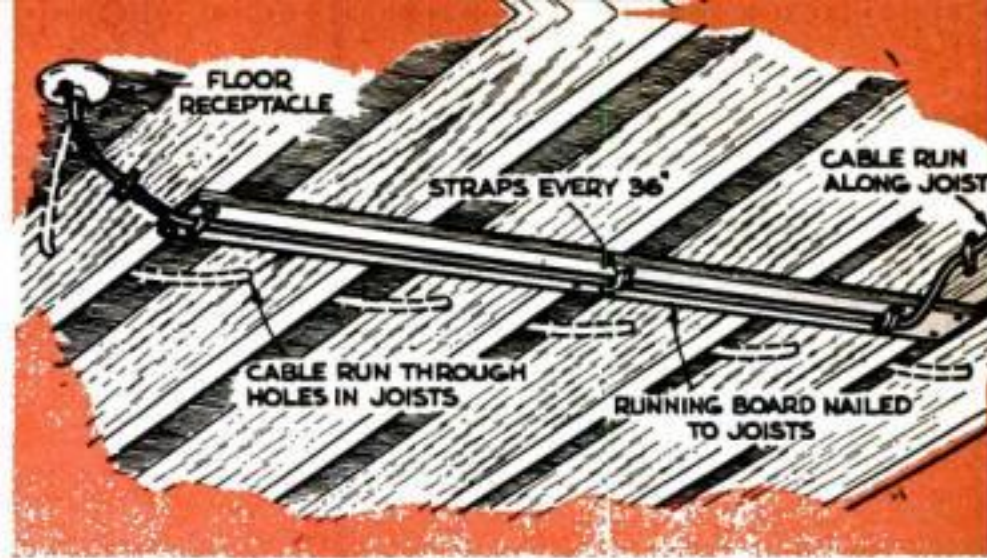
done a good job and keep you on good terms with your insurance company.

Find the right spot. Locate the floor receptacle out of traffic areas, where the cord won't trip anyone. Try to pick a spot between two floor joists (you can sound them out by tapping with a hammer). Drill a small hole, or drive a nail through at the spot. If you get into a joist, or so near one that there wouldn't be clearance for the receptacle, plug the hole and try again.

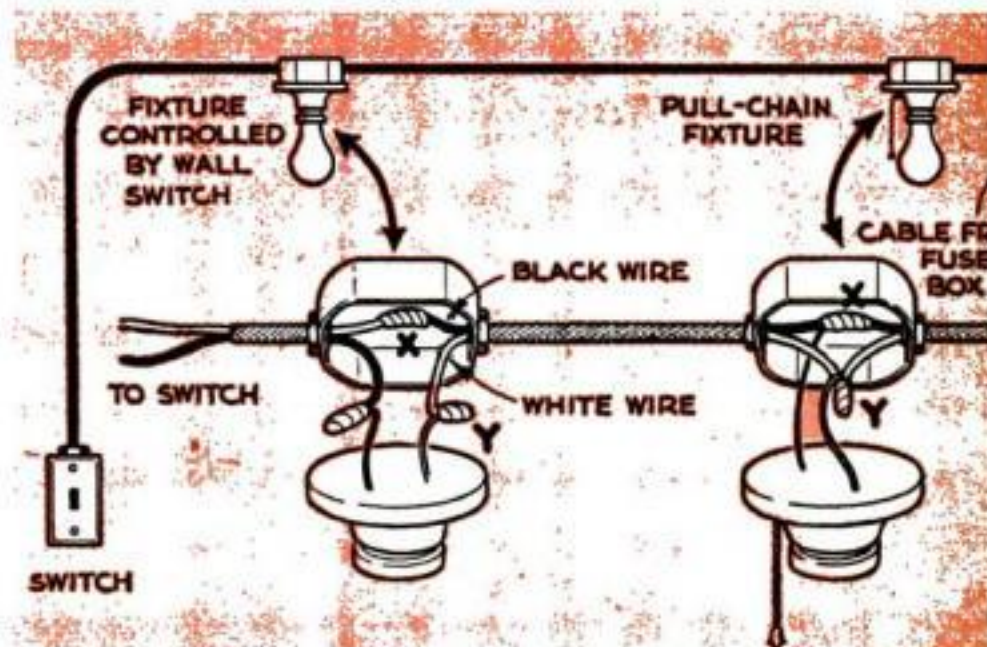
Where to get juice. In the basement, find the junction box or ceiling light nearest the nail hole. If it is a light controlled by a wall switch, you can use it *only* if the power cable from the fuse box runs to the light first, not to the switch. If the switch is between the fixture and the power source, don't hook up at that fixture, or you'll have toast only when the cellar light is burning.

A toaster or waffle iron takes a lot of juice, so don't hook the new receptacle into a circuit on which you have the refrigerator, oil burner or clothes drier. The total current may be more than that circuit should carry.

To check this, turn on a lamp in the fixture you want to take juice from. Then loosen one branch fuse after another until the lamp goes out. Retighten the other fuses,



TWO WAYS TO RUN either nonmetallic or BX cable across joists are shown above. Either cable can be run *along* a joist. Use straps or staples for BX, but only straps for nonmetallic cable. Be sure to put one within 12" of boxes.

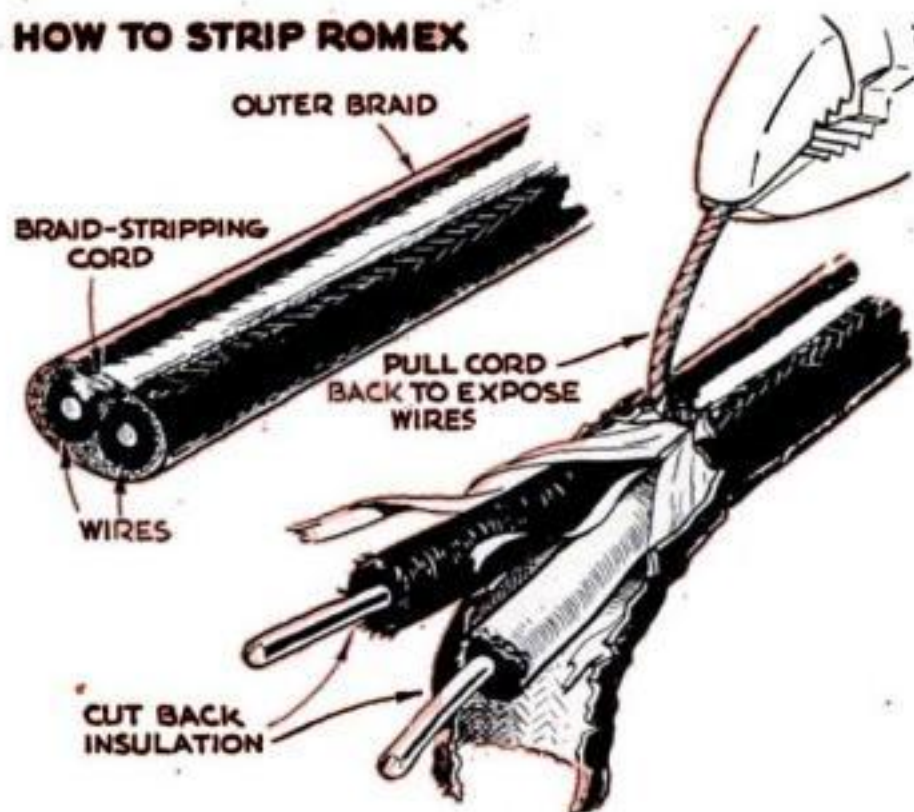


TAP POWER at a junction box, receptacle or light. Examples above show how to wire into two types of fixtures, a switchless socket (left) or a pull-chain socket (right). In both, new wires go to points x and y.

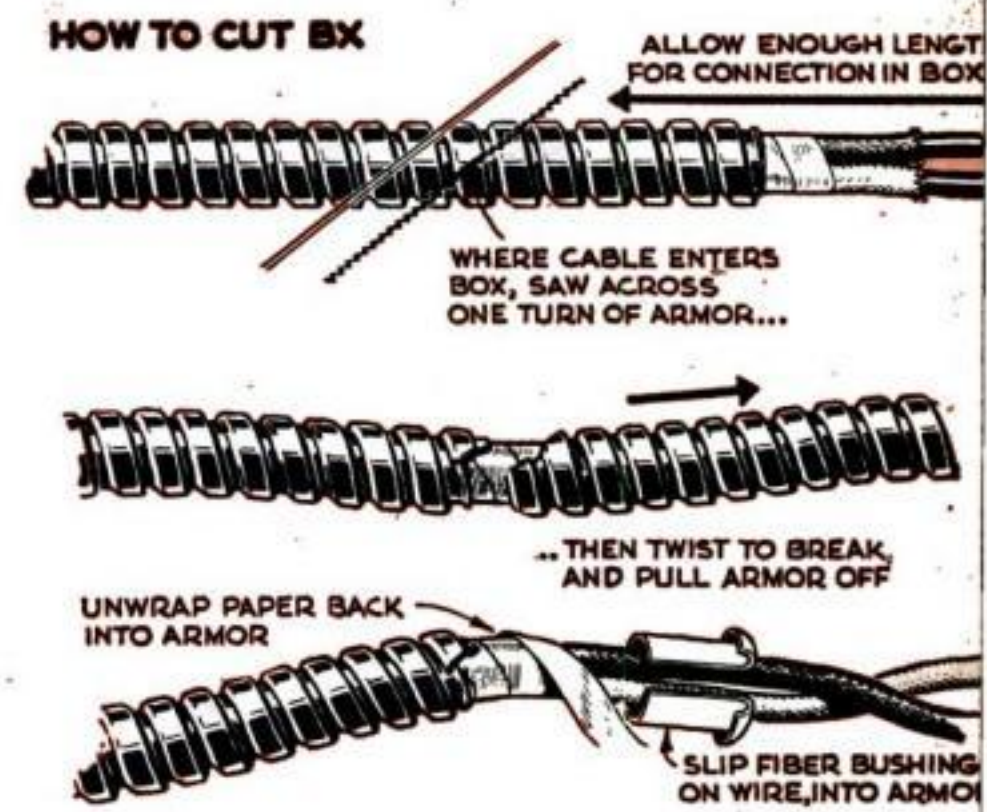
but leave this one loose while you see whether the refrigerator or other appliances will still run. If so, they are on another circuit and you're okay.

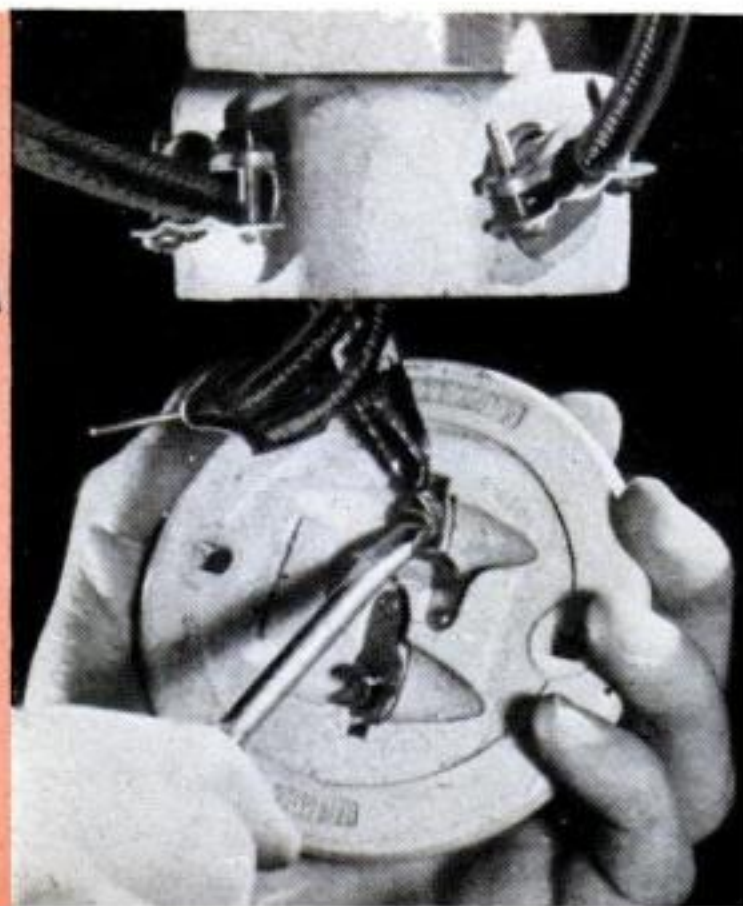
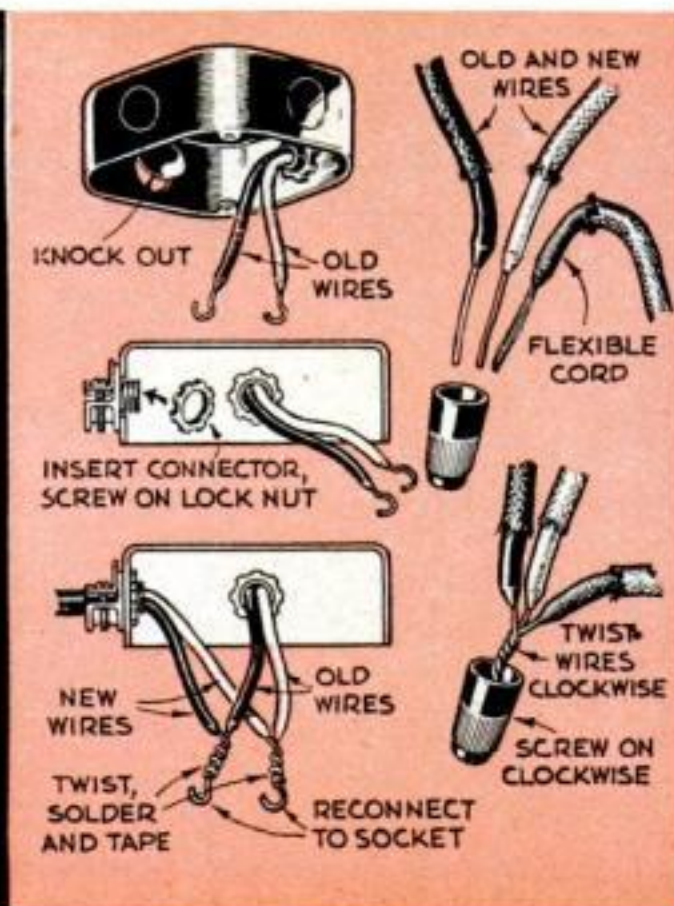
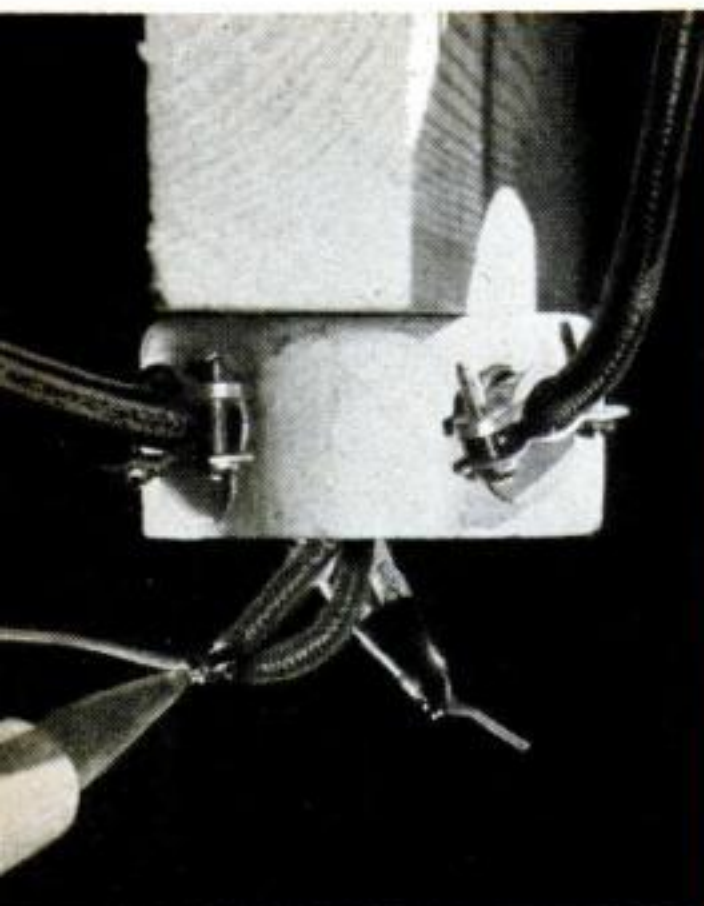
What to wire with. Most wiring today is done with conduit (steel pipe with wires inside), BX (which has a flexible metal armor), or nonmetallic cable (which is covered with impregnated fiber and is often known by the trade name Romex). Find out

HOW TO STRIP ROMEX



HOW TO CUT BX





REMOVE BRANCH FUSE or pull main switch. Disconnect lamp socket. Knock out a hole blank, screw in a new connector and feed new cable through. Bare wires and twist new black wire around old black one, white wire around old white one, letting enough of old wires project to reconnect them to the socket. Sol-

der joints and wrap first with live-rubber tape, then friction or plastic tape. Tighten end of black wire under brass socket screw, white wire under nickel screw, as at right. For solderless joints, twist old and new wires together with short flexible leads. Screw on a wire nut. Run flexible leads to the socket.

whether your local code permits nonmetallic cable. It's easy to install and quite safe.

BX is only a little harder to use, so don't hesitate if your code requires it. The only trick to it is cutting the armor, and that is shown in a drawing. Don't forget to insert the fiber bushing also shown.

Conduit involves pipe fitting and threading. If you can get conduit cut and threaded to order, you can do the rest. However, it may be possible to use cable even if the rest

of your wiring is conduit. Check your code.

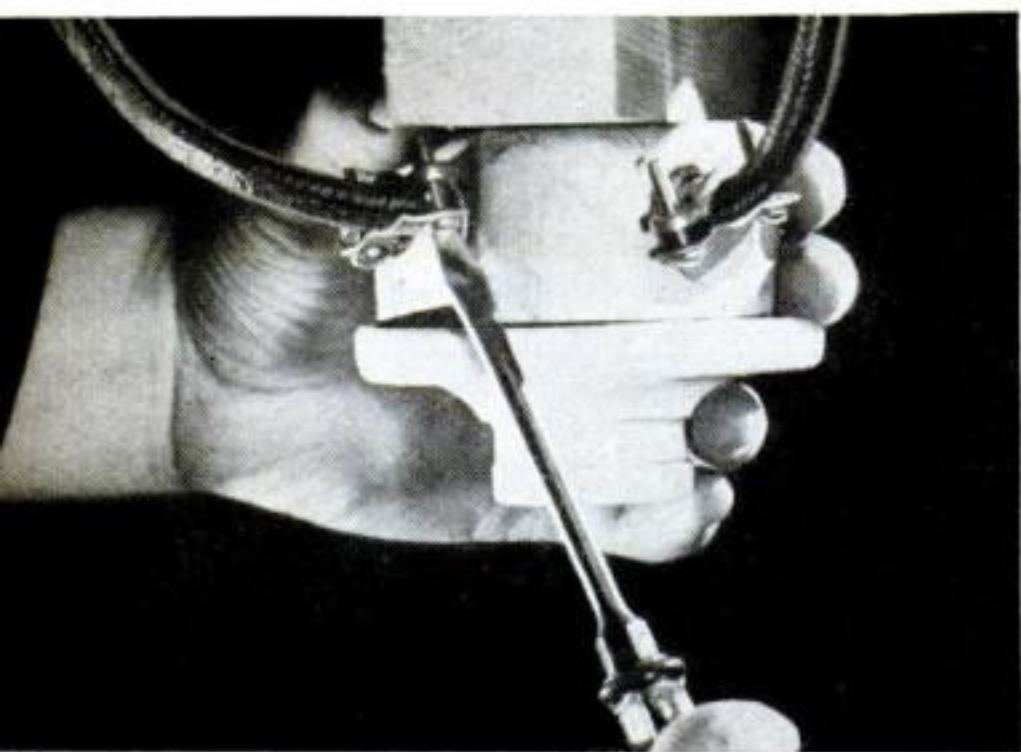
The wires inside the cable must be at least No. 14, and some codes require No. 12, which is larger. Use No. 12, or check to make sure your code permits No. 14.

Making box connections. The rule is that a joint must be mechanically strong as well as electrically sound. The cable must be clamped in one of the holes in the box with a connector and lock nut and securely strapped along the way.

Before making connections inside a box, be sure it's "dead." Pull the main switch, if you have one. Peel back the insulation (being careful not to nick the wire) and twist the bare wires together. Solder the joint, using noncorrosive flux. Then wrap it with live-rubber tape (the kind that stretches) pulled snugly around and well overlapped. Finish with a tight wrapping of friction tape and bend the wires to fit them into the box.

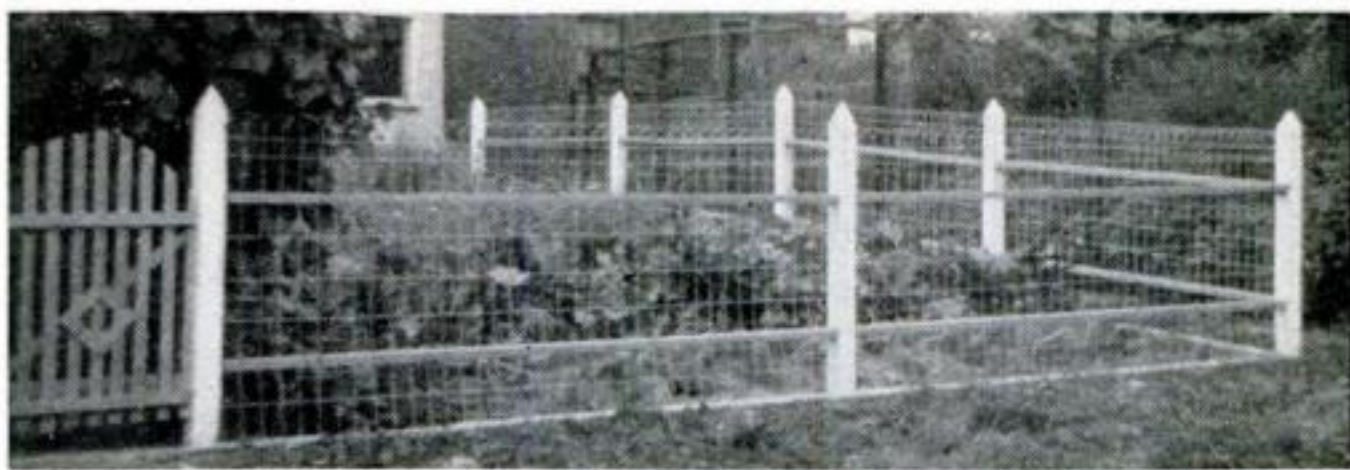
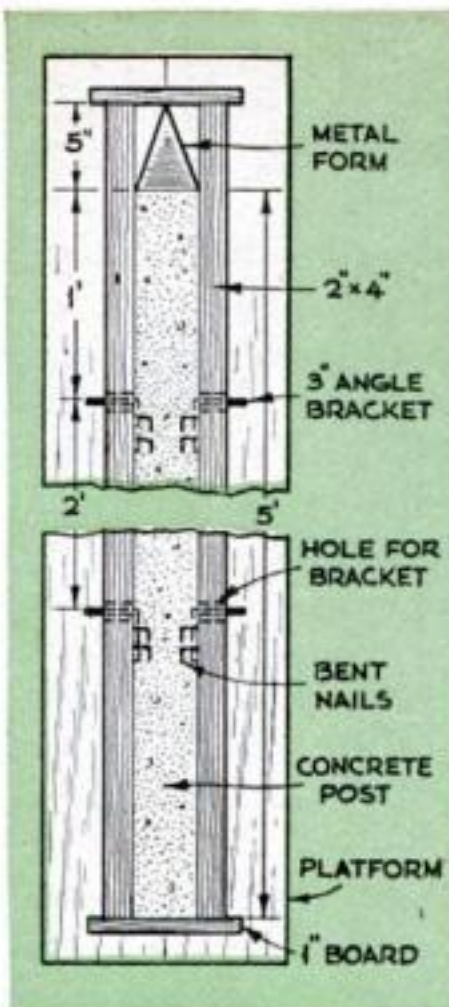
Soldering is easy and fast, but joints can also be made with wire nuts (also called solderless connectors). These are ceramic or plastic sleeves with metal inserts and come in various sizes to accommodate two, three or more wires. Simply screw them on the twisted wires.

END



TIGHTEN CLAMP SCREWS on connector to secure the cable where it enters the box. Then tuck all wires well into the box and replace lamp socket. Finally, put the branch fuse back or close the main switch.

Next Month: Fun with a poker chip that won't cost a thing. Make a magnetic motor of it.



Forms for Concrete Posts Reused as Rails

CONCRETE fence posts, set in a concrete curb, lick the usual fence ailments—rot and termites.

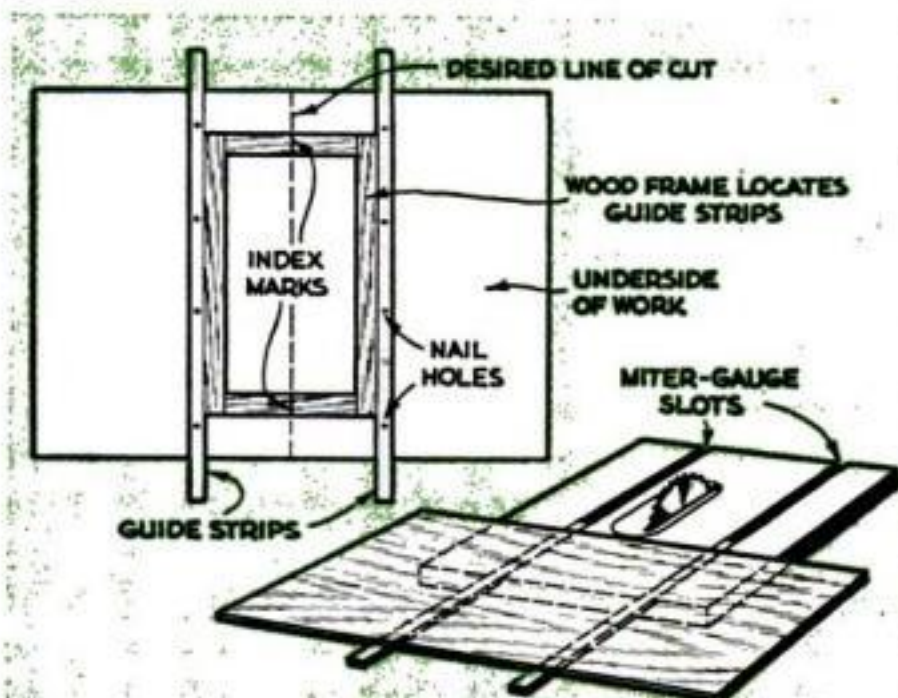
A fence like this is economical to build, too. The two-by-fours for forms to cast the posts can be used later for fence rails. The curb along the base of the fence, while not absolutely necessary, helps reinforce the post setting and also keeps the bottom of the fencing away from the earth. Make the concrete of one part cement, $1\frac{1}{4}$ parts sand and two parts gravel.—*Andrew A. Nelson, The Bronx, N.Y.*

Big Panels Cut on Small Saw

LARGE boards and plywood sheets are almost impossible to cut accurately without the help of a good-size saw-table extension. Lacking such an extension, I devised this setup, which guides large or irregularly shaped pieces into the saw blade with safety and hairline accuracy.

I first obtained two steel strips, about 3' long, that fit the miter-gauge grooves in the saw table. Hardwood strips might also do. With the aid of a template, made up to locate them, I nail the strips to the underside of the work. It is then a simple matter to start the strips in the grooves to support and guide the panel across the table.

I find that kickbacks are completely eliminated as the saw cut is held apart by the guiding strips.—*Irvin Baird, Upper Darby, Pa.*



Paint Cans Hung from Joists

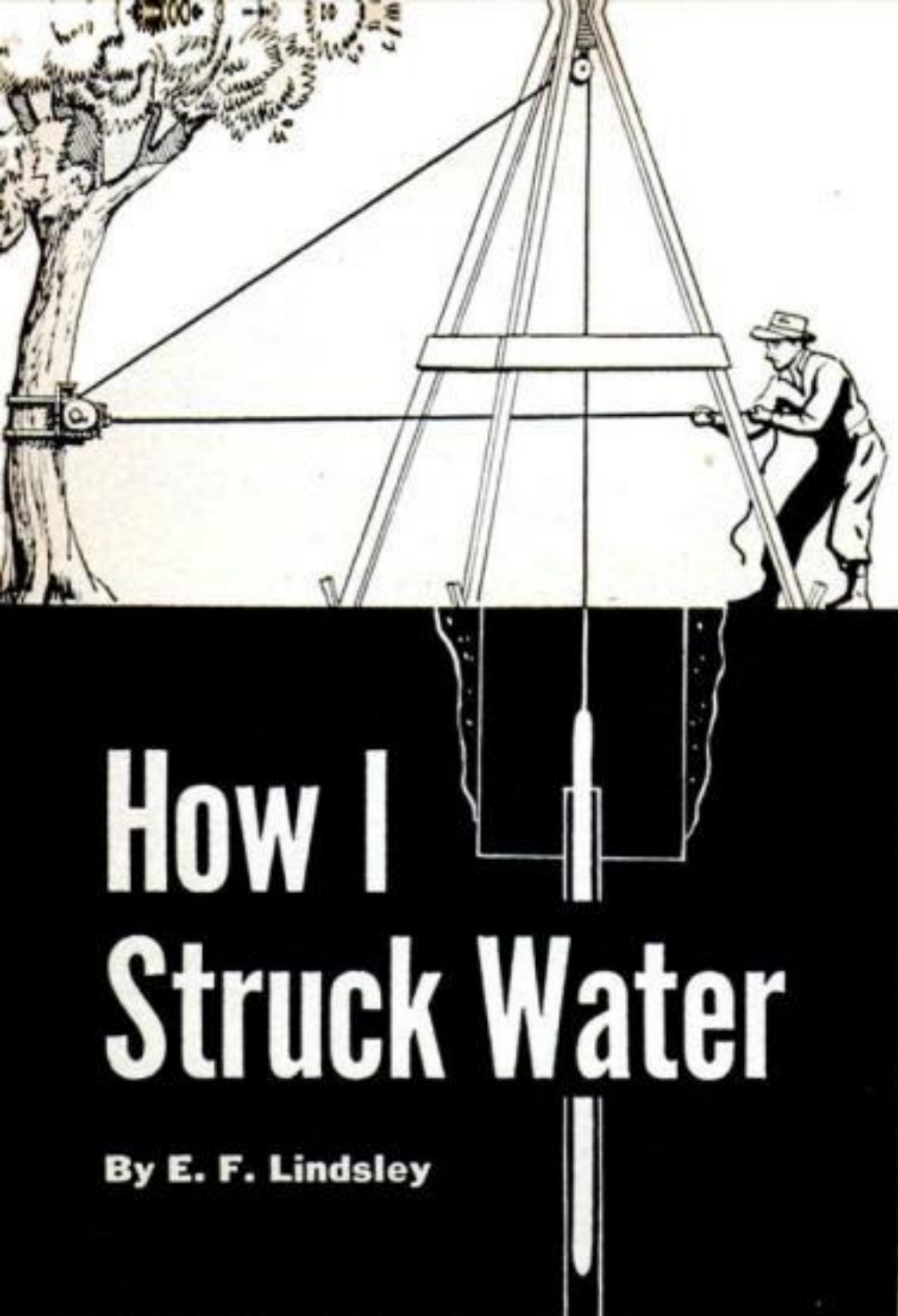


IF YOU are cramped for storage space, utilize the joists in your garage to store paint cans. Drive large nails in a joist and tilt the heads upwards. Smaller cans—half pints, pints and quarts—can be put in a bucket and the bucket hung from a nail.—*Thomas P. Ramirez, Fond du Lac, Wis.*

Workshop Wisdom



*Here lies an electrician named Binger
No longer with us does he linger.
The cellar was wet
But just on a bet
He checked a hot line with his finger.*



How I Struck Water

By E. F. Lindsley

Tapping an underground supply is worth all the weeks of effort it takes to drill a well.

STRIKING water is always the big moment when you drill a well. I can't imagine that even finding gold would give me more of a kick. And completion of my back-yard drilling project was actually equal to turning up a bit of treasure. The job saved me around \$200.

Getting started right has a lot to do with

how easily an amateur drilling job will go. I learned from bitter experience what every professional driller knows—that even a shallow well requires a carefully assembled drill rig.

An A frame, anchored to a nearby building or tree, or a tripod frame can be set up to support the overhead pulley through which the drilling rope runs. I used the first type. As explained last month, tightening the rope around a constantly revolving drum causes a one-lung engine to haul up the drill tool. Loosening the rope lets the 100-pound tool drop for a pile-driver blow.

Frame assembly. It is important that the frame be very solid. Block or stake the lower ends of the legs. Bolt and chain the top ends together so they can't give. Unless you do, the frame may shift while you are drilling, carrying the pulley away from its center above the casing and perhaps canting the casing. The pulley should be bolted to the apex of the frame.

Don't underestimate, as I did, what it takes to keep a small engine and hoist drum on the ground. Mounted on a pair of cedar-post skids, the engine, gear box and drum seemed brutally heavy when I grunted them into position. Just to be sure, I poised a washtub of rocks as ballast on the rear and flopped a 300-pound flagstone on the front of the skids.

But the little four-horse Cushman engine, geared down to 19 to 1, proved a better man than I. When the wet rope fouled on the drum after a shower, the whole shebang—engine, skids and ballast—took off like a rocket-powered raft. In a flash, the engine cranked itself up the rope, swung gracefully under the A frame, broke loose and dropped into the well pit.

That convinced me rock ballast was not enough. My solution consisted of two



START IT STRAIGHT. Unless the casing is vertical, you'll have trouble. Writer pulls on rope to strike gentle starting blows and checks with bubble and square to keep casing straight. Note drive collar on drill tool.

EXTRA WEIGHTS of bar stock and railroad iron are bolted to the driver above the collar. They helped force casing through hard rock. At such times, drilling progress may be measured in fractions of an inch. Perseverance pays.



angle-iron fence posts running from the skids to the A-frame legs in a V-shaped arrangement. With these, a solid mechanical brace was established. In addition, I installed a shear pin between the hoist drum and its driveshaft.

Before starting to drill, I dug a well pit to get below the bushel-basket-size boulders. I had to go down nearly 15 feet before I ran out of boulders. Fellows at the other end of my town have drilled wells without going below post-hole depth for a start. The geology under my back yard just happened to be against me.

After digging the hole, I dropped a pair of old oil barrels without tops or bottoms on top of each other to form a protective wall around the casing. The shock of a drilling tool causes caving quite rapidly in a poorly shored hole.

Starting to drill. Using the drill tool as a plumb bob, I located the spot under the pulley where the casing should go. Then, using a square and level to keep the pipe vertical, I started driving the casing by hand until it was on its way.

As you drill, you must add water to the hole through the casing—but not too much. The drum and rope must be kept clean and dry for a snappy release of the rope so the tool will drop quickly for hard impact. The usual practice is to keep turning the rope by hand as the tool falls so the drill strikes at a new angle each time.

Under continued pounding of the drill, soil and rock in the bottom of the casing break up into bailable mud by virtue of the water added or already present. Too much water in the casing hole cushions the impact of the tool.

A distinct ring comes up the casing when the drill strikes stone. The sound becomes duller as the solid matter gives way. Eventually the stuff becomes mushy. Pulling up the tool at this stage usually shows a thick coating of mud and rock chips.

Bailing out the muck. If the mud you get is thin and watery, you are probably battling a stubborn rock, and bailing is not much use for a while. If the mud is very thick, add a little water, drop in the tool and churn things up a few minutes so the bail bucket has a better chance of slipping the mud through the check valve.

You'll know you have struck water when you discover that the tool is more or less floating in the casing and a solid blow cannot be struck. The bail bucket will bring

up more water than you have added. The water will be clearer each time. This experience may occur several times before you get deep enough. A well that pumps freely in the spring and fall may contain only surface water and turn into a dry hole in the summer. In many areas where an impervious layer such as limestone or hardpan runs like a floor under gravel and sand, unsafe surface water often collects in pumpable quantities just above it.

Drilling in rock. With persistence, it is usually possible to drill through these tough strata into much better water-bearing material. But such drilling is not for the easily discouraged. Several hours of hard pounding may net only an inch of progress. In such stubborn going, it is essential that all the impact the drill tool can muster be delivered to the point. You can help this by standing at the casing and giving a quick downward



IF CASING BENDS, you're in for some extra work. It happened to the writer soon after he started, and a 12-ton truck jack and log chain (above) had all they could do to yank out the casing. Then, after he had driven almost to water level, a boulder caused enough bending to prevent easy passage of drill tool. To get down final six feet, he made multi-jointed tool at right. Tool was severed into segments with a cutting torch. Segments were strung together with loosely fitted studs and welded-on heads.



How the Pump Was Installed



1. FOOT VALVE was attached before first section of suction pipe was lowered into casing. This is required only if a jet pump is offset more than 50', but author put it on to hold water in pipe to check joints for leaks as each section was added.

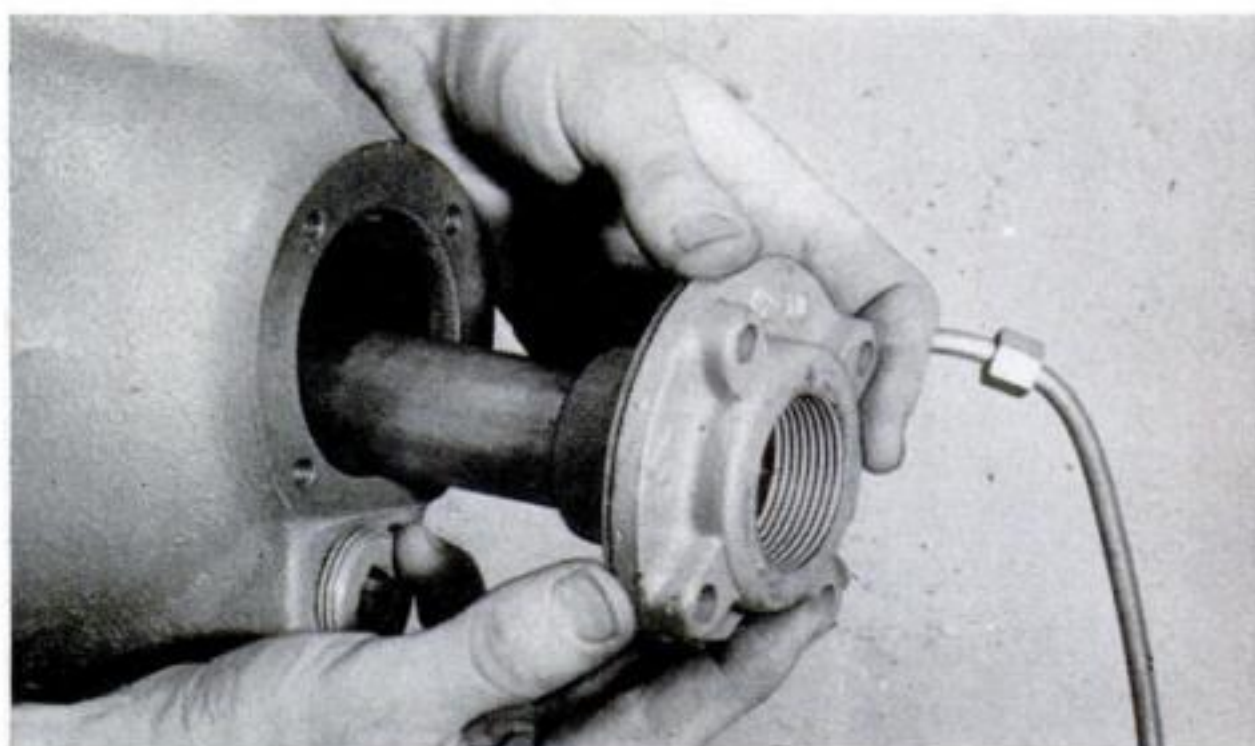
2. FIRMLY CLAMPED to prevent dropping, each section of suction pipe was filled with water and left for a while before next section was screwed on. If water fell, pipe was raised and joint tightened. Airtight couplings are vital to good pumping.



3. A CLOTH and a plumber's cleaning rod were used to swab out each pipe length before installation. This protects pump against metal particles and threading chips.



4. JET PUMP was installed in basement for best cold-weather protection. Pipe runs to well through hole in wall. Pump is shown here set up for shallow-well operation.



5. PUMP WAS CONVERTED to deep-well operation because writer felt water level might not stay high enough for shallow-well suction. Conversion, made with special kit, includes substitution of tube and adapter for jet and check valve formerly inside pump.

tug on the rope at the same time you release the tension.

When you're using the drill tool to drive the casing, you must also get all the oomph you can on the casing collar that takes the impact from the drive collar on the drill. The collar I used was a malleable iron coupling of the extra-heavy-duty type made for well casing.

I ran into several viewpoints on whether you should drill a hole ahead of the casing and drive the casing down into the hole, or first drive the casing about all it would go and then drill the material from the inside. I worked mostly by the latter method.

How drive shoe works. The drive shoe acts as a funnel to cut through and guide any fairly soft sand or small gravel to the inside of the casing where the tool can get a square smack at it. But the same slanting, funnel-shaped surface on the inside of the drive shoe often acts like a wedge lock, or roller clutch, when you drill ahead and a small round stone jams between the drill and shoe.

I would be plugging along nicely some 8" or 10" ahead of the shoe when a sudden shudder and groan of the rig would announce that the tool was stuck. This is a frightening experience. Each time, luckily, I was able to jar the tool loose by heavy side blows of a lead hammer at the top of the casing.

Tape shows depth. After a few of these scares, I worked out a system where I drilled until the slightest tendency to hang up showed I was starting to get ahead of

the shoe. Then I drove the casing, sometimes 6" or 7", sometimes a foot or more, depending on how easily it went. Next I'd bottom the tool and tape the rope flush with the top of the casing. Thus, by watching how deep the adhesive tape was getting into the casing later on, and by comparing this distance with the measured distance I'd driven the casing, I always knew about when I should start being cautious about sticking. In strata rock and hardpan, drilling ahead a short way is necessary.

Test pumping. Once into an apparently satisfactory supply of water, the common practice is to put on a temporary pump and see what kind of water volume you can pull without lowering the water level too far. If you have friends on the local fire department, or are a volunteer, the pumper makes a good test outfit, providing you throttle down a bit. The firemen will love it, and so will all the kids in the neighborhood.

An important thing to look for, in addition to pure and adequate water, is the type of material in which the casing ends. Sand or soft material does not ordinarily seal the open end of the casing effectively. Within a short time, the sand works up in the casing to the foot valve or jet, and then the job of well servicing starts. A commercial driller likes to seal off in rock that opens into a water vein. Large gravel, sandstone or other mixed stone may also be good.

Installing the pump. In the beginning, I set out to install a shallow-well jet pump. Later, I got to thinking about the possibil-

ity of the water level dropping during the summer and converted the pump to a deep-well type. With a shallow-well jet pump, the venturi-shaped jet is mounted in the pump near the impeller. The deep-well member of the family has its jet in the well casing below water level. When a big 4" or 6" casing is used, the deep-well jet should have two pipes, one pressure and one suction. When a 2" casing is used, there is no room for a second pipe. To get around this problem, a special packer-type jet is clamped inside the casing by a rubber seal ring. The space between the inner wall of the casing and the central pipe then serves as a second pipe.

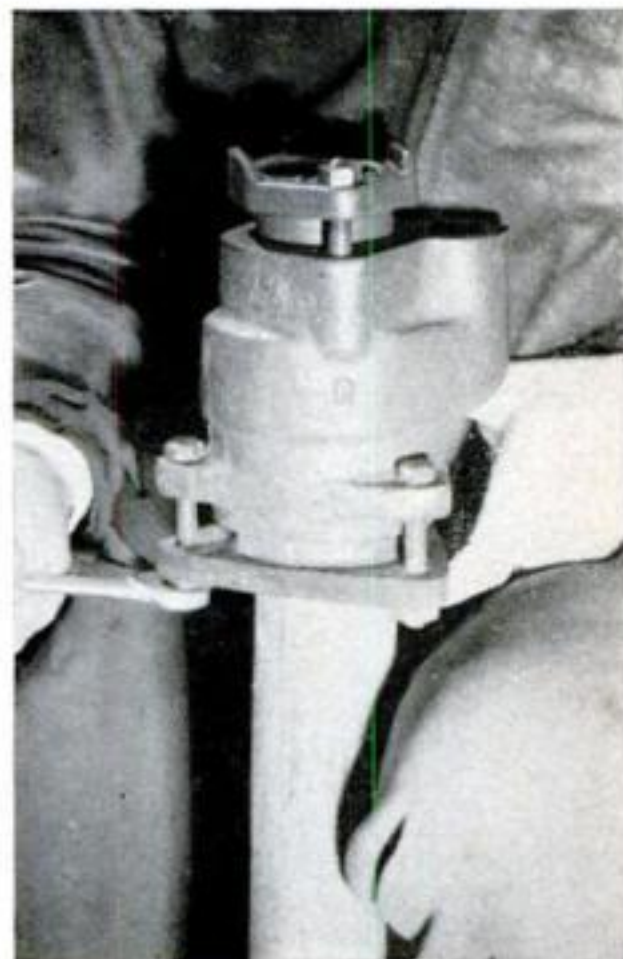
If you install your pump in the basement, be sure the pipe has a slight downward slope to the well. And remember to install a good joint coupling in an accessible spot, in the basement, so the pump can be disconnected and moved for service when that is necessary.

Electrical connections. Like oil burners, well pumps deserve their own electrical circuit, with private circuit breakers or fuses and a switch readily accessible for emergency shut down by some member of the family less familiar than you with electrical systems. If you have to depend on yourself for fire protection until a pumper can arrive from a nearby town, give some thought to protecting the pump and its electrical supply even though the basement may be ablaze. A separate, well protected circuit to keep the pump running may save your home and belongings. END



6. PACKER-TYPE JET and foot valve at bottom of suction pipe were also needed. If casing is larger than 2", a two-pipe jet can be used. Without room for two pipes, space between casing and suction pipe serves as a pressure pipe.

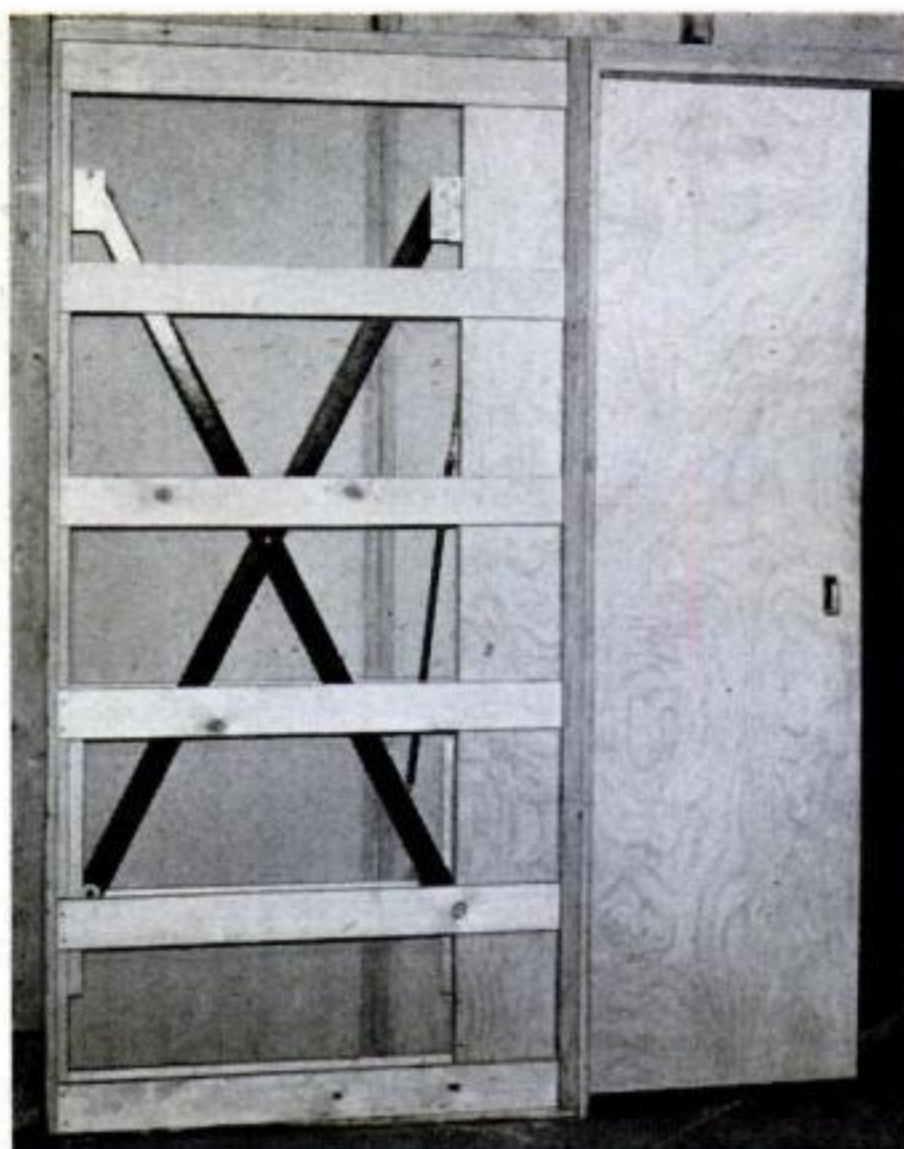
7. SANITARY SEAL was clamped to top of casing. Two pipes were then run from seal to pump, one for suction, one for pressure.



New Products for Handymen

Sliding Door Floats in Air

BECAUSE there are no tracks at top or bottom, this door is easy to operate and practically noiseless. It floats in and out of the wall—suspended by a steel scissors-like mechanism. The adjustable balance spring lets the door move at the slightest touch. Increasing tension on the spring makes the door self-closing. It can be installed in a standard 4" wall during construction of a new home or remodeling of an older house. The hardware can be removed for repairs without disturbing the wall section. The unit fits doors as large as 3'6" by 7'. *Ezway Sales, St. Paul, Minn.*



Brackets Drive in Like Nails



WHEN the four prongs on the back of these clips are hammered into wood, the clips form supports for shelves. Designed to take $\frac{1}{4}$ " material, they are made of 22-gauge steel and are $1\frac{1}{4}$ " long by $\frac{5}{16}$ " deep. *Asa D. Scott Industries, Chicago.*

Wrapped Cubes Color Paint

ACCURACY in matching colors is insured by this method of coloring paint. A pre-measured cube of color concentrate is dropped, wrapper and all, into a can of base paint. A solvent in the oil-base paint dissolves the film that encloses the $1\frac{1}{4}$ " cube. This system gives you a choice of 108 colors that can be matched exactly. *McCabe Paint & Varnish Co., Irvington, N. J.*



Hook Lowers Screens

PUTTING up or taking down screens and storm sash from second-story windows is easier with this clamp. You can lower or raise them on a length of rope. A metal slide prevents the clamp from opening and also serves to release its grip. *Household Gadgets, Inc., New York City.*



Attachment Ends Paint Drips

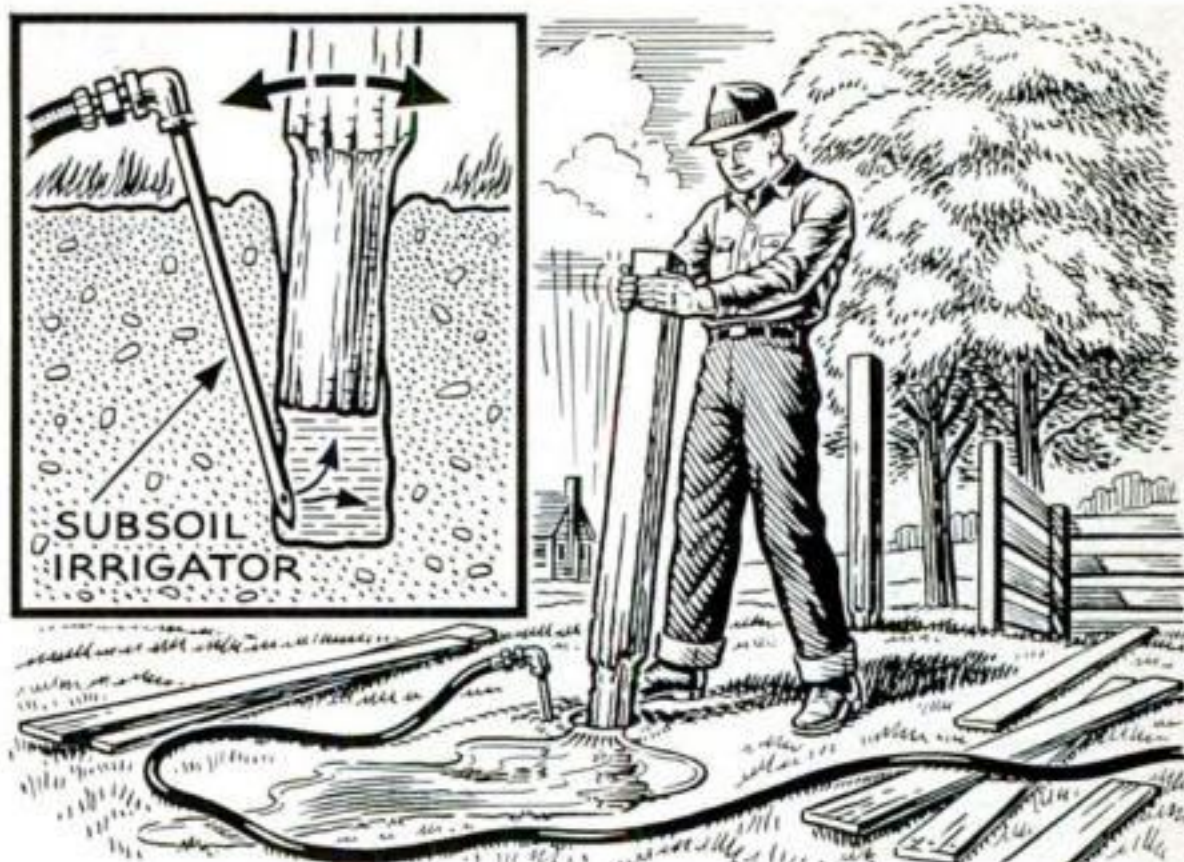
THIS plastic accessory stops paint from running down the side of the can. It also serves as a brush rest and can carrier, and keeps the rim and groove clean to permit tight resealing. In use, the ears of the bail fit under the rim. The Norloc Paint Boy is available in two sizes—for quart and gallon cans. *Norton Laboratories, Lockport, N. Y.*



Water Can Help Ease Out Stuck Fence Posts

OLD fence posts, often difficult to remove, will come out easily if you apply simple hydraulics.

Sink a subsoil irrigator into the ground under the post, turn on the water pressure and rock the post. It will practically float out of the ground. Or drive a piece of pipe under the post, withdraw it and force a garden hose into the hole. A portable spray rig could also be used to haul a supply of water and provide the necessary pressure.—W. H. McClay, Pasadena, Calif.



Bandage Box Holds Cigarettes



FOR a rugged cigarette case for camping trips, try a small-size bandage tin. It will take regular or king-size cigarettes.—W. S. Head, El Cajon, Calif.

Auto-Body Solder Fills Wood

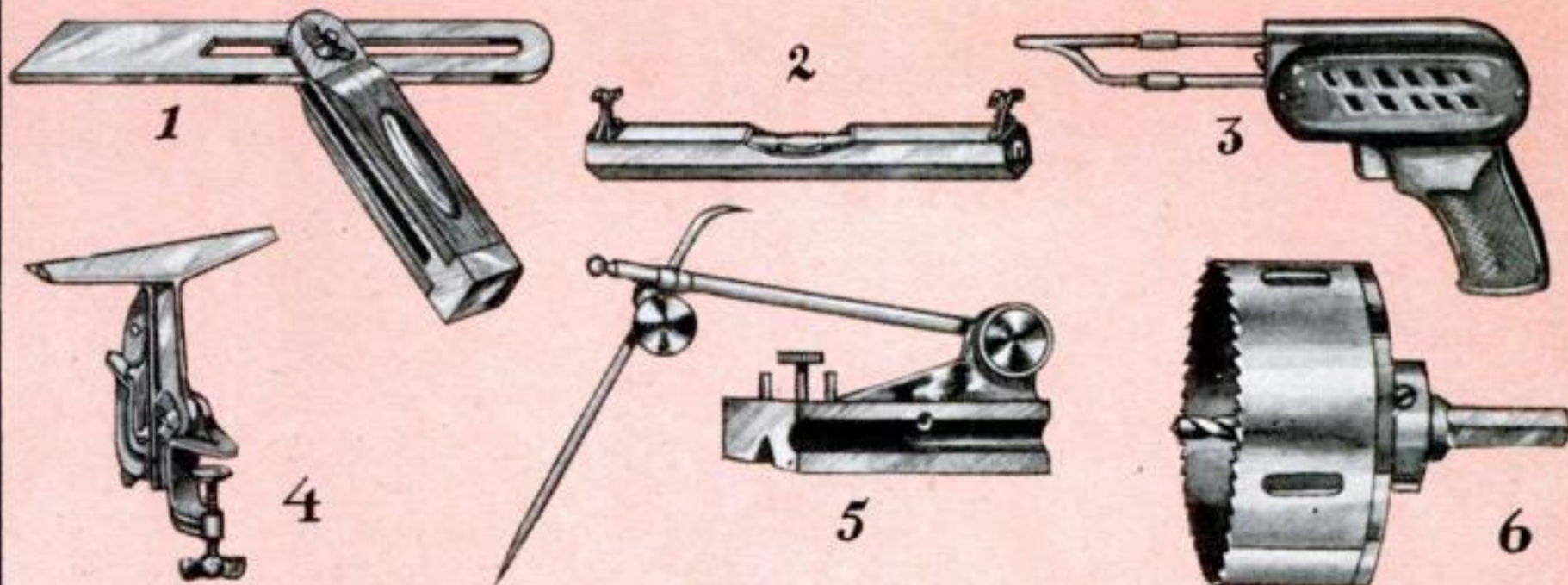
THE metallic lacquer-base filler used in auto-body work is good for filling dents and cracks in wood that's to be painted. It will stick to both new wood and old finishes. Having a very fine grain, it can be applied so smoothly that little or no sanding is needed. It is not porous and requires no extra primer.



By C. B. Colby

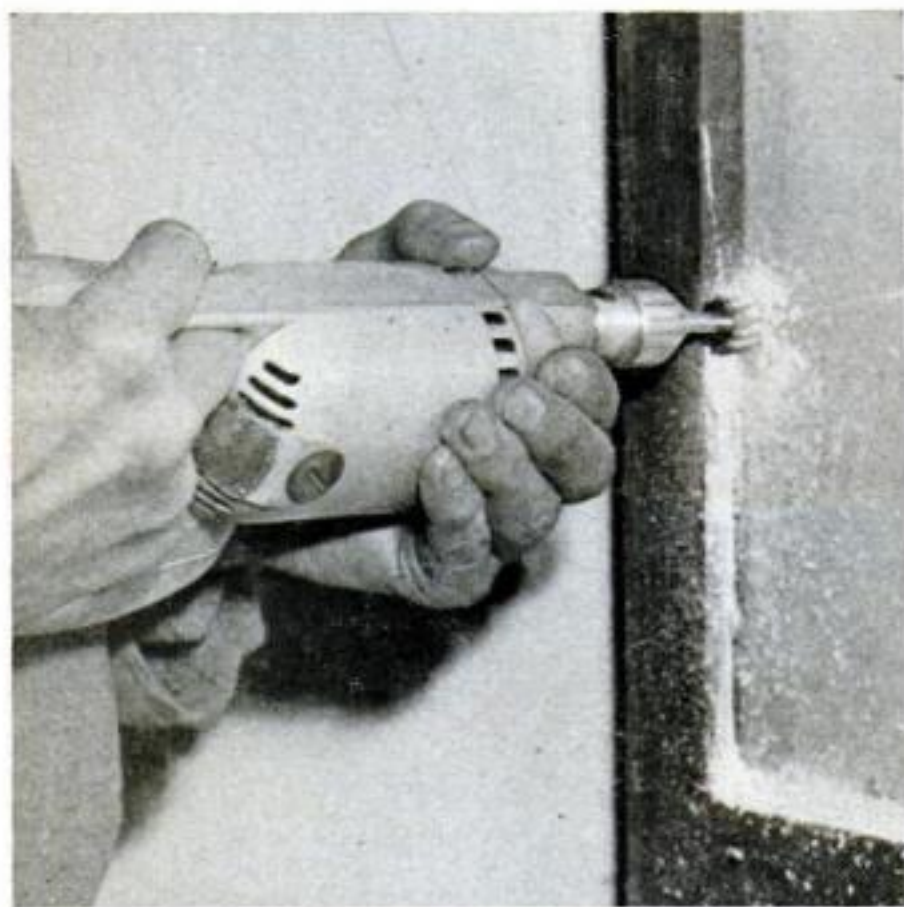
TOOLBOX TEST

Sharpen up your knowledge of shop tools. Name these and invert the page to score yourself.



1. Adjustable bevel; 2. line level; 3. quick-heat soldering gun; 4. saw vise; 5. surface gauge; 6. hole saw.

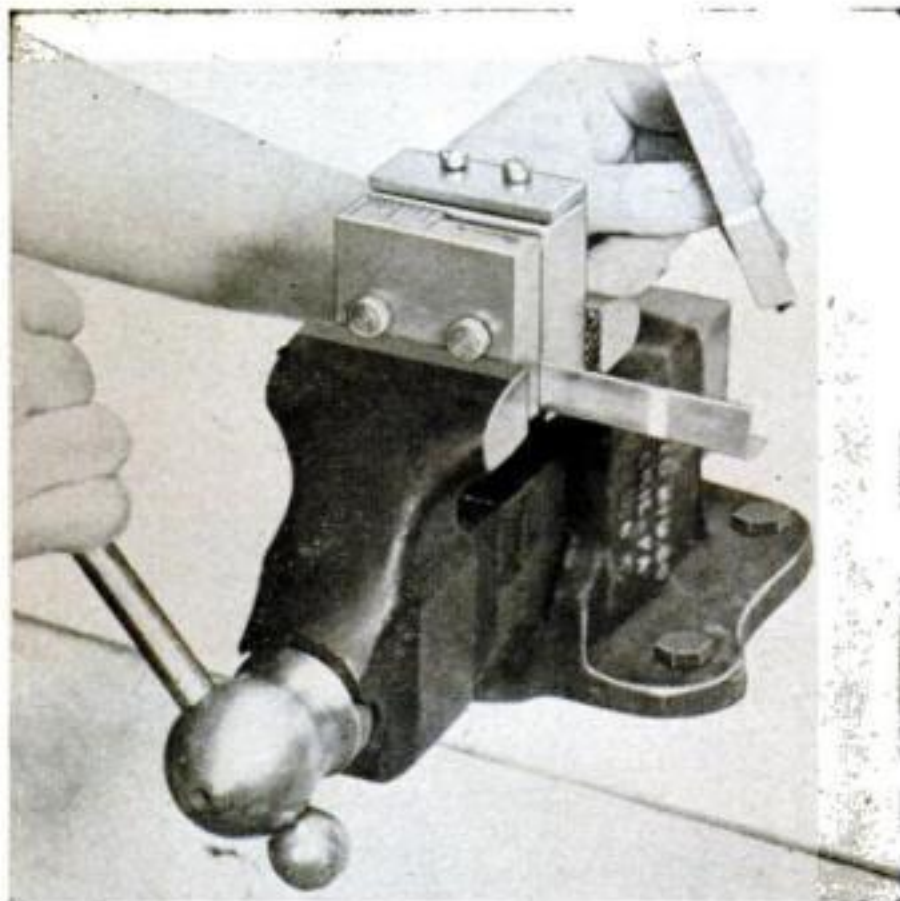
New Tools



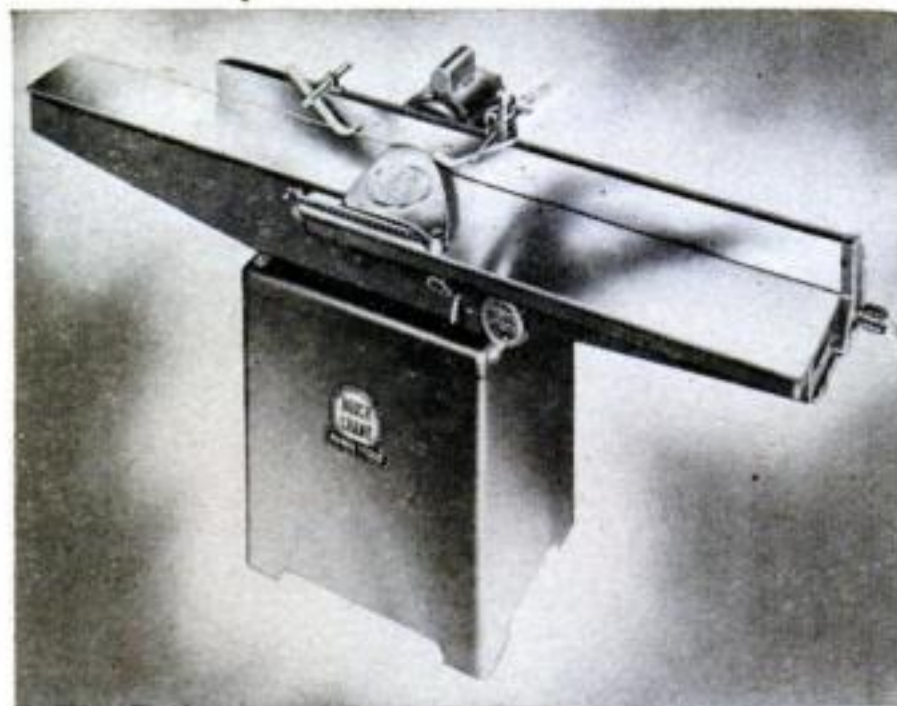
Tool Removes Old Putty. Chucked in an electric drill, this cutter quickly removes old putty from window sash. A guide pin, which rides the molding to prevent overcutting, is removable for cutting close to the glass. *H. E. Watkins Co., Oakland, Calif.*



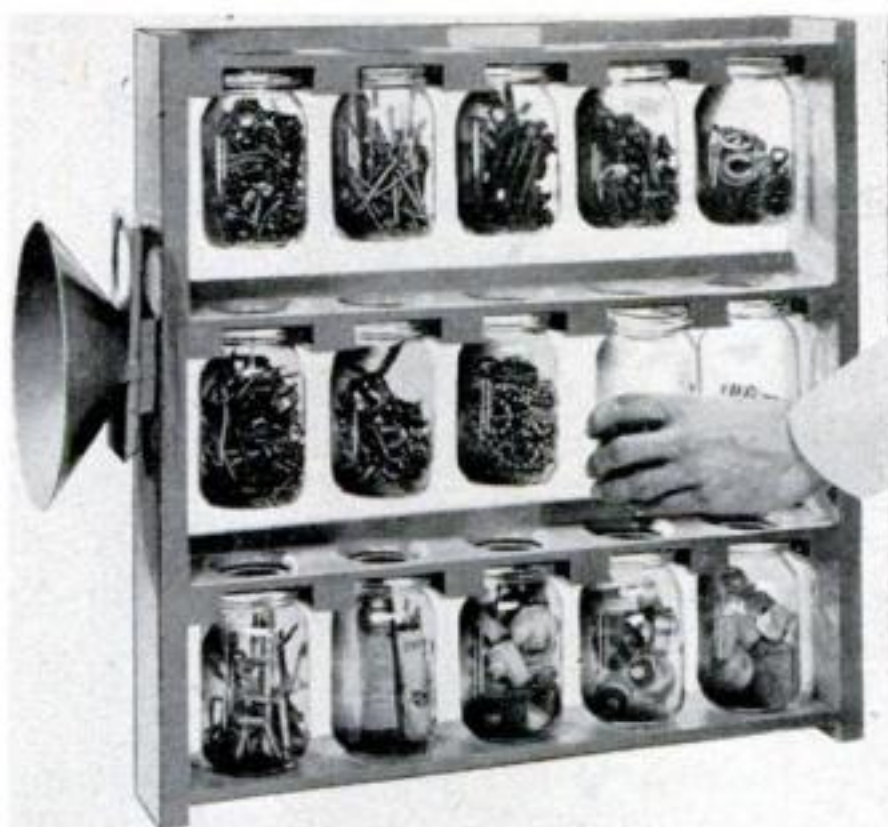
Ratchet Knob Turns Screwdriver. The steel grip of this screwdriver can be locked stationary or set to turn left or right. When not needed, the ratchet grip can be pulled off the Tenite handle of the screwdriver. *Kipton Industries, Kipton, Ohio.*



Joggling Blocks. This tool, when locked in a vise, bends accurate offsets in metal strips. It is available in three sizes to handle metals from .016" to .051" and provides calibrations from 1/8" to 1". The side plates that hold the leg of the angle can be adjusted with a screwdriver. *M-M-A, Inc., Lancaster, Pa.*



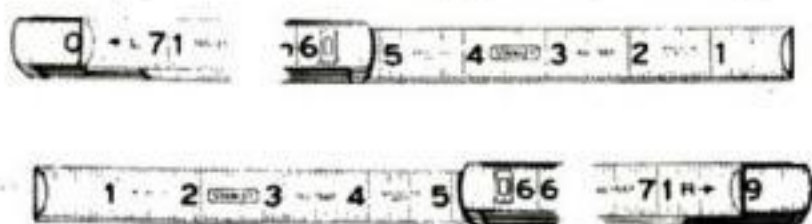
Welded, All-Steel Jointer. Using steel, which is 2½ times as strong as cast iron of the same thickness, permitted extending the tables of this jointer without increasing its width, thickness or weight, or the floor space it requires. The machine is made in three models: two 6" jointers with 36" and 60" tables and an 8" model with an 84" table. The 8" jointer has four knives and the 6" models three knives. All the knives, according to the maker, cut to the same depth within .002" to .003". *Boice-Crane Co., Toledo.*



Parts Rack Has Sorter Funnel. To select parts from a jar in this rack, you dump the contents in the wide-mouth funnel that comes with the rack. To put them back, you just hold the funnel over the jar and slide open a slot in the funnel bottom. The rack comes in three sizes—20, 30 and 45 12-ounce jars. A 15-jar unassembled kit is also available. *Toolcraft Products Co., Denver.*



Socket Wrench Is Adjustable. By turning the knob on the shank, you can make this wrench fit any bolt or nut from $3/16''$ to $5/16''$. The tool is especially useful in radio work since it will hold a nut or bolt to thread it into hard-to-get-at spots in a radio chassis. Turning the knob extends or retracts the shank to open or close the jaws. *Adjusto Tool Co., Miami.*

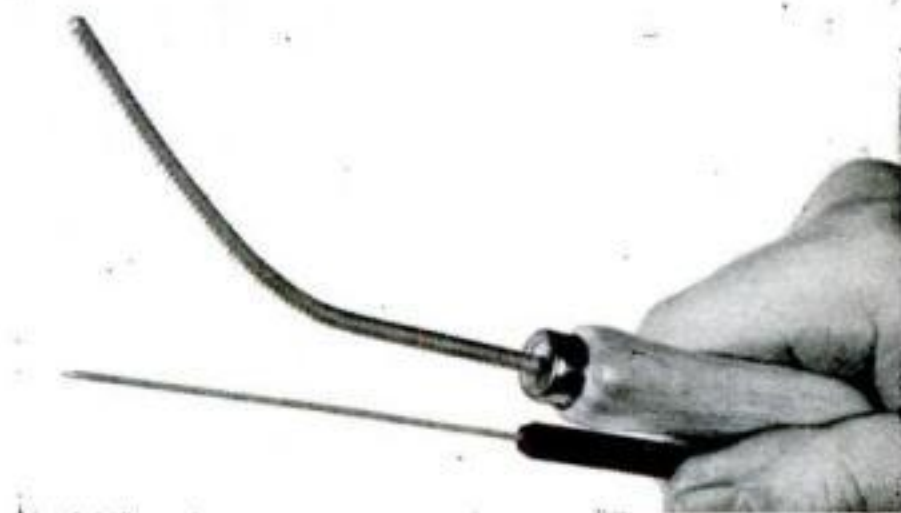


Rule Can Be Read Two Ways. You can read this 6' folding rule from left to right or from right to left by simply flipping it over. Numbers on the reverse side appear right side up, instead of upside down as on regular rules, so they can easily be read without turning the rule end for end. *Stanley Tools, New Britain, Conn.*



Tungsten Carbide Scriber. When laying out lines on very hard materials, such as hardened steel or glass, the tungsten carbide point of this scriber cuts sharp, well defined lines. It is available in two sizes to fit 10", 18" and 24" Starrett height gauges. It is interchangeable with standard scribers on these gauges. *L. S. Starrett Co., Athol, Mass.*

Files Reach Tight Spots. The larger file at right can be bent to fit the work or to get around corners. It has a soft core permitting easy shaping without heating and comes in six diameters from $3/32''$ to $1/4''$. The smaller file fits into holes and corners too small for other files. Both cut metal, wood and plastic. Western distributor is Tec Imports, Van Nuys, Calif. Eastern distribution is by Thrifttool Sales Co., New York City.



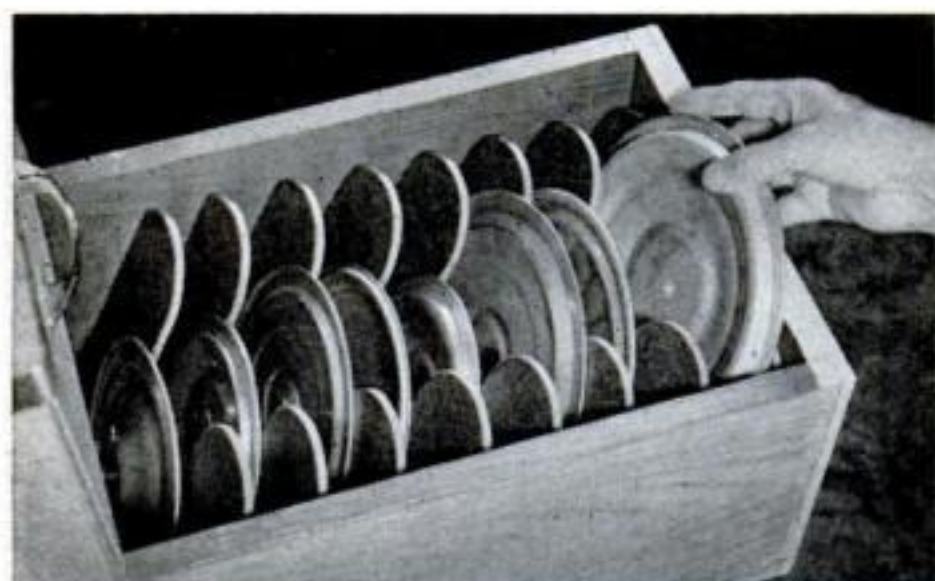
Tailor-Made Storage



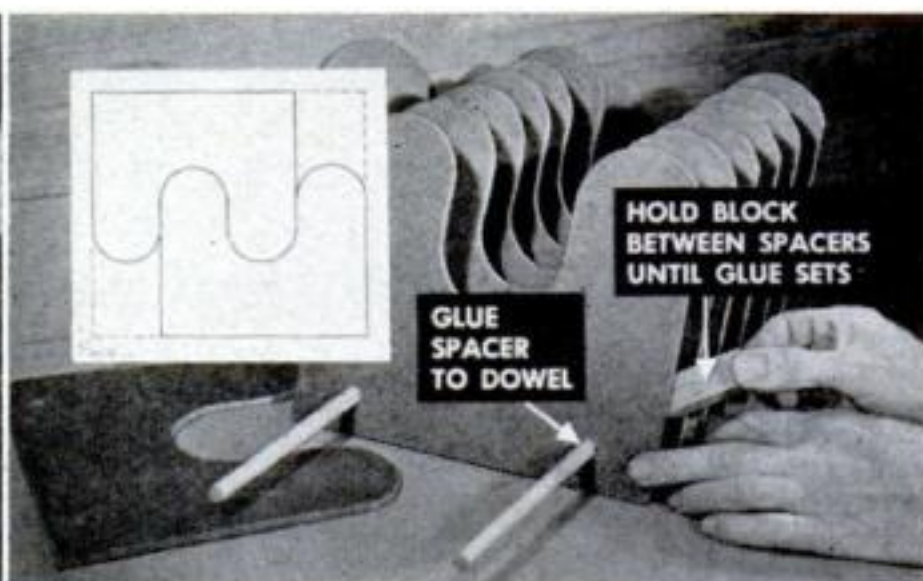
Remodeled Cupboards and Drawers Eliminate Catchalls

It's not how much room but how well it is divided that makes the difference between a junk-shop jumble and easy-to-get utensils. Pictures on this page show how some lumber, hardboard and hooks make extra room by organizing the utensil-storage space.

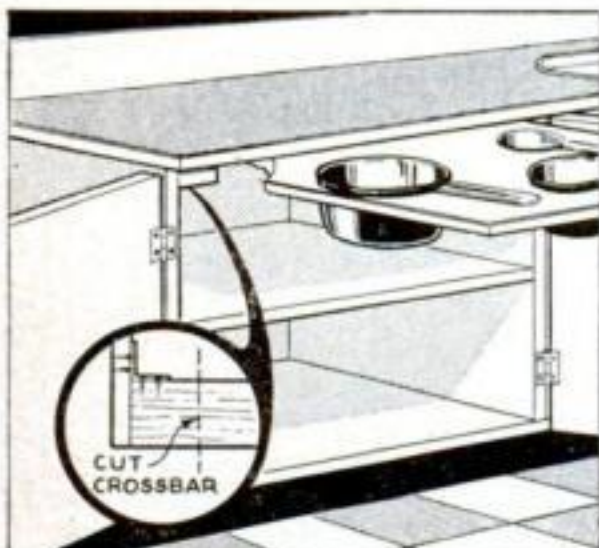
TWO-LEVEL, SIDELESS DRAWER holds a lot of big hard-to-store appliances. Nearly any under-counter cupboard with a swing-out door can be made over into a pull-out drawer, making the back as accessible as the front. This one slides in ball-bearing races on wooden tracks.



POT-LID DRAWER has composition-board spacers to keep covers neatly arranged. Hardwood dowels pass through angled holes drilled in

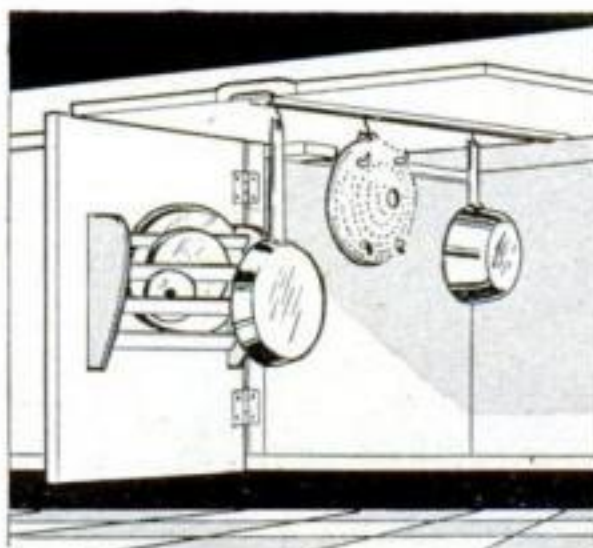


the spacers. The lines on the inset drawing show cutting pattern that makes two spacers from one piece of composition board.



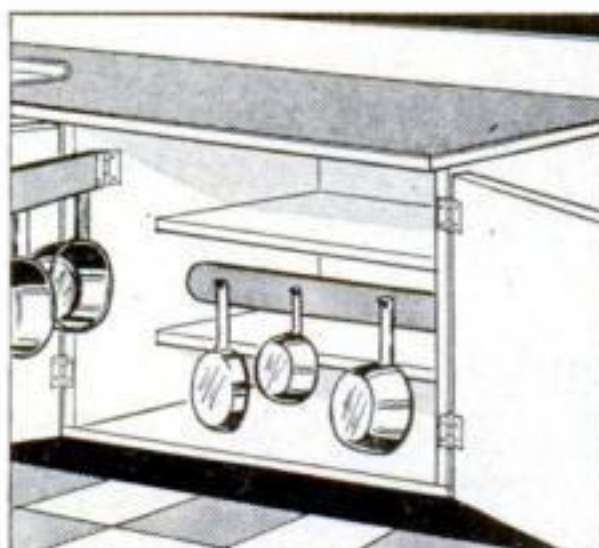
PULL-OUT SHELVES make it easy to reach the back of a storage cabinet. A work-table extension that isn't needed for working can serve as a nesting tray for odd-size pots (left). Cut outs are scrollsawed to fit the pot rims.

Or you can add storage space without giving up working surface by hanging pans from the underside of a pull-out (center). Lids fit



in slats on door. In both arrangements you have to cut away the crossbar from under the shelf. Metal angles installed as shown give it back its old strength.

Hinged arms near the front of a cupboard (right) keep pots handy. You can swing them out of the way to get at things stored on the shortened shelves in back.

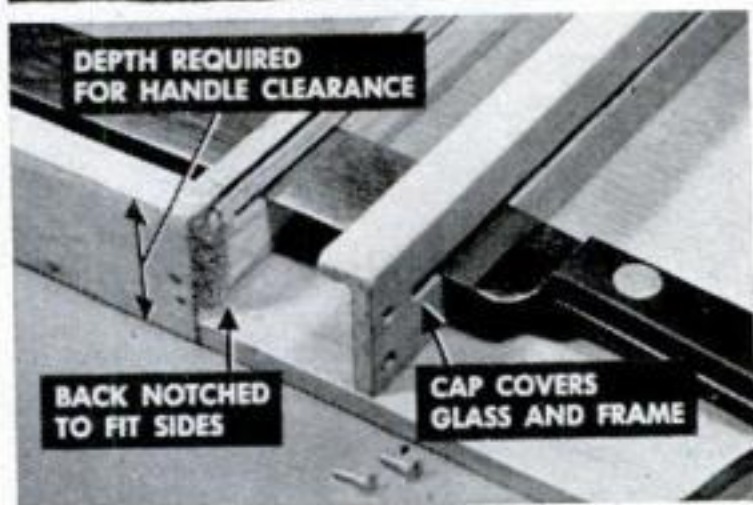


for Your Kitchen

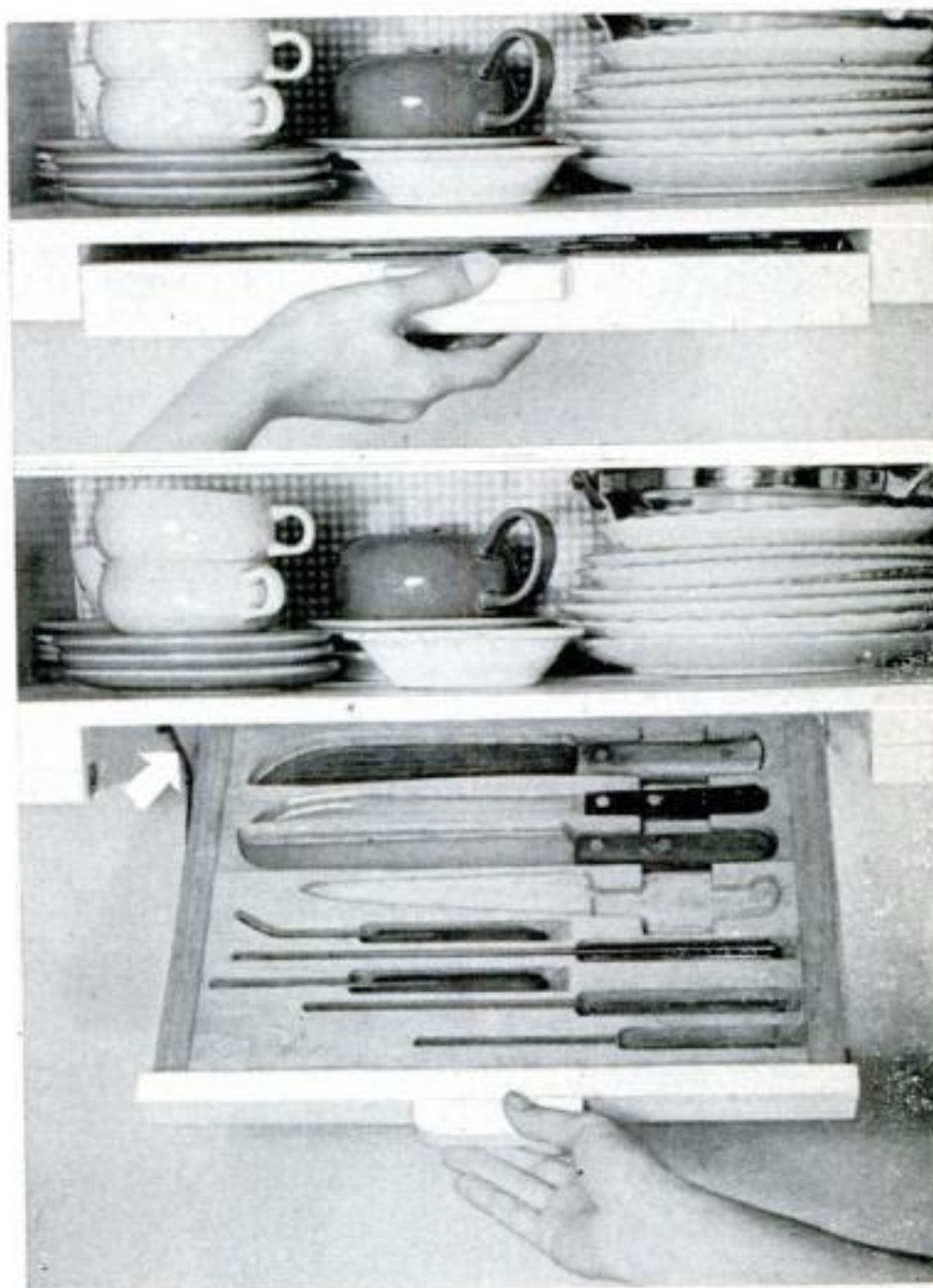
Special Racks Keep Knives Sharp—and Safe

RACKS are the answer for cutting tools. Three examples are pictured on this page—one for the wall, two for drawers. All will keep the knives handy to the cook but away from the children, and protect the edges from dulling nicks.

A SHALLOW DRAWER can be fitted for proper storage of carving and paring knives. A length of dowel, cut to fit between the drawer sides, is slotted for the blades. The $\frac{1}{2}$ " strip at the front of the drawer supports the handles of long knives, keeps their points from tipping up.



FRAMED WALL RACK has glass front to keep out dust and dirt. The sides are grooved for single-weight window glass. A slotted cap is placed over the top crosspiece as shown in the lower photo to give extra thickness and hold the knives upright.



HIDE-AWAY DRAWER slips into the bottom trim of an over-counter cupboard. This one tips down to a 30° angle, is held open by the cabinet-lid support (arrow). Bullet catches lock the drawer in closed position. Knife cut outs routed in a softwood insert tray keep the knives from sliding out of position when the drawer is opened and closed.

Helpful facts about filters...

Why they do so much for your snapshots

Taking snapshots without a filter can be like eating flapjacks without butter—their full flavor and appeal are often not brought out.

Examples of what some of the most popular Kodak Wratten Filters will do are shown on the left. For instance, the K2 Filter is perfect for making clouds look like clouds—white and fleecy. And for more dramatic sky emphasis, you have the more powerful dark yellow G Filter. Yellow filters, including the new Kodak Cloud Filter for use with inexpensive cameras, may be used with orthochromatic or panchromatic films.

For emphasizing background foliage and clouds—and at the same time giving a pleasing natural modeling to faces photographed against a blue sky—you can use the green Kodak Wratten Filter X1 (with panchromatic film only). And for the most spectacular, thrilling sky rendition of all, try the red A Filter (panchromatic and infrared films only).

As you use and enjoy filters, you will want to add to your collection. So be sure to see your Kodak dealer for a complete list of Kodak Wratten Filters. Prices start at \$1.65 (Kodak Cloud Filter, any size, \$1.72).



Normal photograph



Taken with Yellow (K2) Filter



Normal photograph



Taken with Yellow (G) Filter



Normal photograph



Taken with Green (X1) Filter



Normal photograph



Taken with Red (A) Filter



Warm up your distant color shots with a Kodak Skylight Filter—With this filter you reduce the bluish cast that often appears in distant scenes. Use it to get warmer-tone pictures of mountains, seascapes, sunlit snow scenes . . . pictures made in open shade under a clear blue sky and on overcast days. Requires no change in normal exposure. Prices start at \$1.65.



Reproduction from normal color transparency



Reproduction from color transparency using Kodak Pola-Screen

Darken the sky in your color pictures

—A Kodak Pola-Screen does the trick—in color or black-and-white. Also offers the only sure way to subdue reflections from glass, wood, water, and other nonmetallic surfaces. The effect your Pola-Screen will have on the picture may be predetermined by looking through the Kodak Pola-Screen Viewer—a miniature screen which fits over the indicator handle of your Pola-Screen. Varying degrees of sky-darkening can be obtained by rotating the screen. Price of Viewer, \$6.75; Pola-Screens, from \$6.75.





A Kodak Close-Up Attachment gives you pictures like the one above at right

Move in on your subject this easy way—Slip an inexpensive Kodak Close-Up Attachment over your lens and you'll give your camera new picture-taking ability. You can "shoot" at closer range than is normally possible with a fixed-focus camera, and get big, clear images.

Use the attachment for head-and-shoulder pictures, close-ups of pets and flowers. The little story above shows you how easy it is—how pleasing the results. There are sizes to fit most Kodak, Brownie, and fixed-focus Cine-Kodak Cameras. Any size, \$1.63.

An inexpensive supplementary lens does wonders too

For extreme close-ups—Kodak Portra Lenses 1+, 2+, and 3+ give pronounced close-ups of subjects with both still and movie cameras. When you place one in front of your camera lens you step up its power for short-range photography of people, nature studies, and

table-top subjects. Kodak Portra Lenses are graduated in power as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. A 2+ lens and 3+ lens combined give the effect of a 5+ lens. From \$2.59.



Normal Close-up



With Kodak Portra Lens 1+



With Kodak Portra Lens 2+



With Kodak Portra Lens 3+



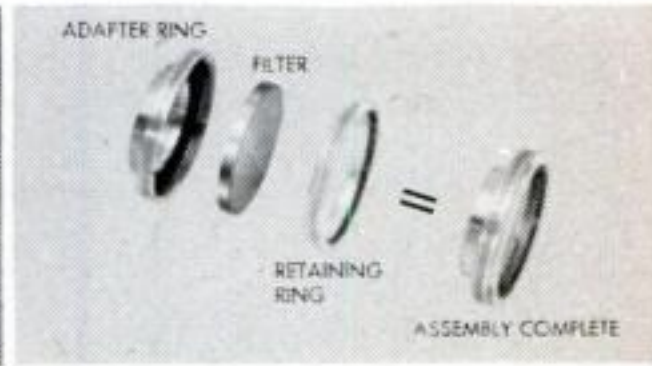
With Kodak Portra Lenses 2+ and 3+



Protect your filters this easy way—Kodak Combination Filter Cases are handsome leather cases that protect lens attachments and provide a convenient way to carry them. One compartment holds a Kodak Adapter Ring, Filter, Lens Hood; the second, three filters. Series V, \$4.25; Series VI, \$4.95.



Shade the eye of your camera—A Kodak Lens Hood helps to guard against light-streaked photographs by making it easier to keep sunlight from striking your lens directly. It also serves to reduce sky "flare" when pictures are side-lighting by the sun or by photo lamps. From \$1.65.



A single Adapter Ring accepts filters and other lens attachments—The two-element Kodak Adapter Ring is the basic unit of Kodak Combination Lens Attachments. Its nonrusting chrome plating matches perfectly the quality finish of your camera. Available in all series sizes. Prices start at \$1.29.

Your Kodak dealer is fitted by training and experience to give you valuable help in your hobby of photography. He'll be happy to "talk shop" any time.

Prices are subject to change without notice

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak
TRADE-MARK

How Belanger Builds Winners

[Continued from page 94]

remark to a visitor with a tincture of complaint. "We never sit down around here."

Belanger hires three more mechanics during the racing season. That's not counting Belanger himself, who, on the testimony of his grooms, is the best mechanic of them all. Nobody touches a piece of plumbing—fuel, water and oil lines—on his cars but Belanger. He won't allow it.

He is perfectly willing to gamble on a change in his cars, but his risks are calculated.

Improvements Are Constant

Traditionally, cylinder walls in all automobiles have been mirror-smooth to save friction and wear and maintain compression. Belanger's aren't. They're deliberately scored. Oil lodges in the scratches. He found out, by trying, that it gave him better lubrication at high speeds.

Improvements in the cars are constant. At San Jose last year Bettenhausen broke a rear-brake hydraulic line at the 16-mile mark of a 100-mile race. Braking on three wheels would have thrown the car out of control. He drove the rest of the race without brakes.

He had a shutoff valve for his front brakes but none for the rear. Now, on his recommendation, there are shutoffs on both sets.

At Indianapolis last year Wallard, too, had brake trouble. A nut holding the right-rear brake cylinder to its bracket failed. He was only 12 laps from the finish, but the fright in the Belanger pit as he skidded through turns without brakes led to a change in the type of nut used.

Drivers Picked with Care

A championship stable takes good chauffeuring. From personal experience at the wheel, Belanger knows how to pick his drivers. He started earning his living in his late 'teens by washing cars at a dollar a day. In time he bought a Ford and hopped it up. For four years he drove the Ford in dirt-track races. To keep an anxious mother from finding out, he entered his jalopy under another name.

Belanger's chauffeurs are shrewd and knowing. Melvin Bettenhausen—everybody knows him as "Tony"—has driven more 100-mile races than anybody else in the business. Slight-framed, wiry, nervous, he runs a small farm and an automobile agency in

Tinley Park, near Chicago, between racing seasons.

Like horse jockeys, the chauffeurs of gasoline alley have their preferences in men and mounts. Tony regards George Salih, chief of the Belanger pit crew, as one of the greatest racing mechanics alive. Salih was named the outstanding racing mechanic of the year in 1951. Tony feels the same toward Dale "Tiny" Worley, one of the grooms in the stable. Tiny weighs 250 pounds and more without the weight of a cylinder block in his hands, but he moves like lightning during the pit stops.

At the start of the season Belanger drops his work at his automobile agency, his lumberyard, his feed store and his two farm-equipment stores, and dons coveralls to work alongside his drivers and mechanics. He takes his business accountant with him to keep meticulous records on his cars during all races.

Records Kept of Every Lap

The performance on every lap of every race is recorded. He can tell you how much time a particular mount required on the 11th lap at Syracuse in 1950. He can tell you its carburetor settings, magneto timing, gear ratio, fuel mixture, how many pounds of weight each wheel carried, and the number of pounds of air in each tire. The tires are extra important. A soft tire flexes too much. Flexing causes heat. Heat destroys tires.

The record book serves another purpose, too. It's source material to answer questions in letters, telephone calls and telegrams after each race run on a dirt track normally devoted to horse racing. The inquiries run the gamut of subjects from valve diameters to fuel capacities. Horse-track habitués will bet on anything.

END

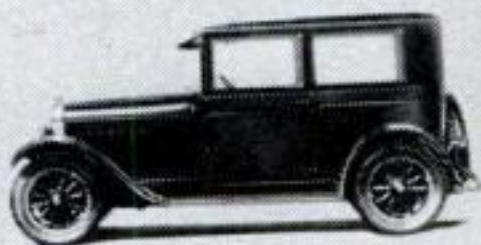
Trick Simplifies Thread Cutting

WHEN you set the lathe compound at 30° to cut a 60° thread, multiply the single depth of the thread by 1.1547 to determine the compound feed for proper thread depth.

The same trick is handy in accurate turning. With the compound set at 30°, a movement of .001" on the graduated dial of the compound will advance the tool only .0005". —J. C. Magee, Schenectady.

on every *Pontiac*

1926



1933



1940

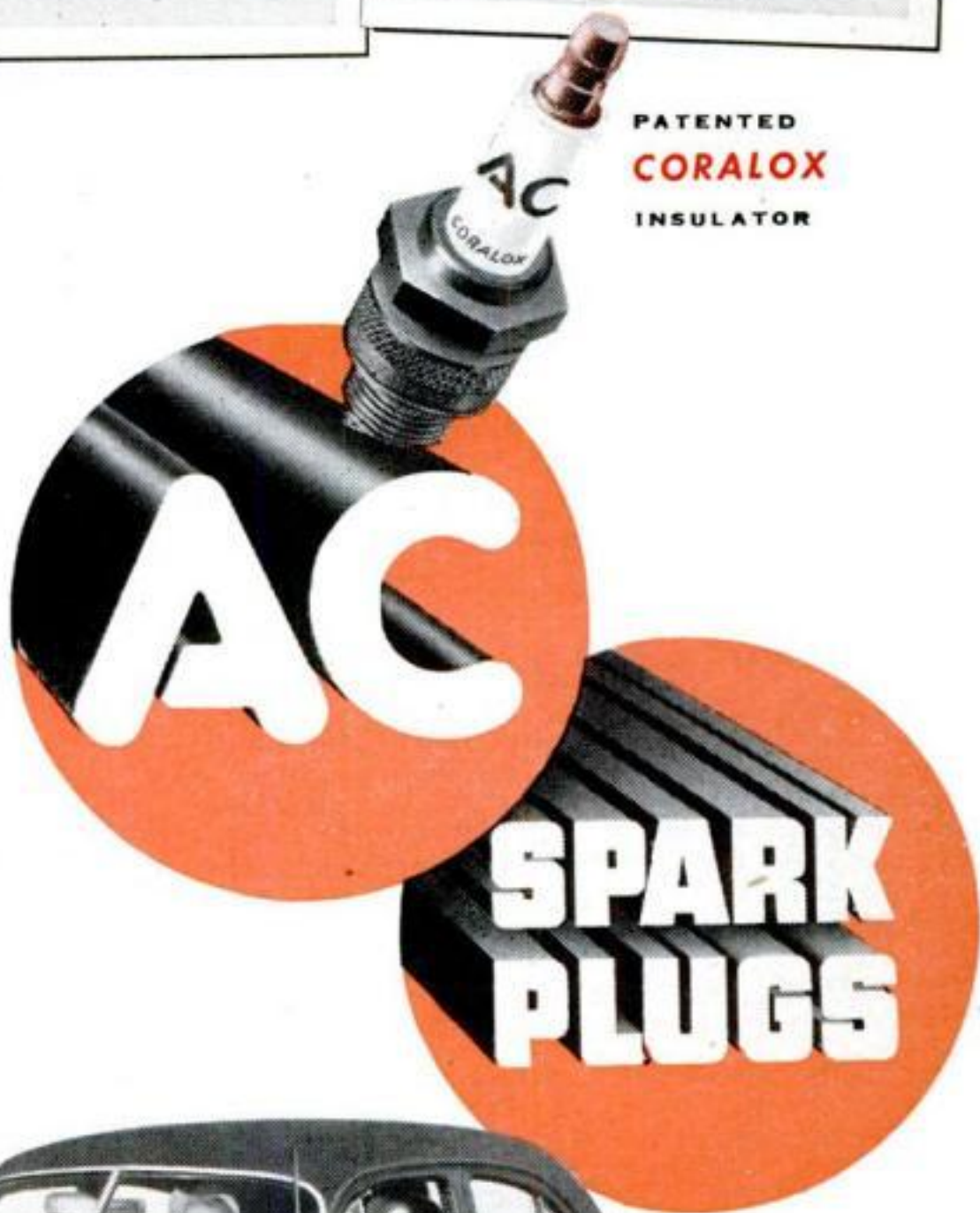


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This Pontiac-AC partnership has been in existence for 26 years -- with Pontiac supplying the power -- and AC providing the spark that helps convert this power into mile after mile of motoring pleasure.

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Are you getting top performance out of your engine? To be sure, specify ACs the next time your car needs spark plugs.



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CORALOX
INSULATOR



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AC SPARK PLUG DIVISION



GENERAL MOTORS CORPORATION



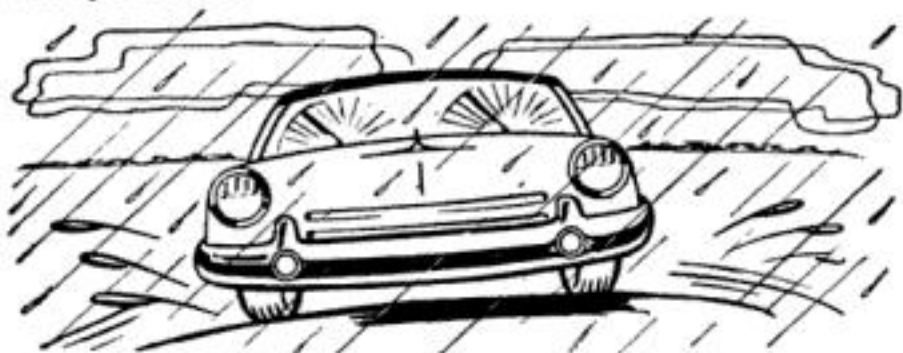
Care and Feeding of Engines

BY S. P. CORP

MAKE CHROME LAST LONGER

Chances are that calcium chloride or salt were used to melt ice and snow on your pavements last winter. Both have a chemical action on chrome plating. You may find your bumpers and other chrome parts pitted with small rust spots.

To improve appearance, and to prevent rust damage from spreading, borrow your wife's kitchen scouring powder and remove those rust spots. Then give all your chrome a coating of good wax. In fact, the chrome will last longer if you wax it every time you wash your car.



ROAD TAR AND OIL

Don't let spots of road tar or oil remain on the finish of your car. Use tar cleaner to remove them. If you use gasoline, be sure it's white gasoline—and be very careful with it. This is part of the thorough washing your car deserves. So is the job of washing away all salt accumulations under fenders, particularly where sheet metal is fastened together. Use a good polish to restore lustre, and don't worry if a little color shows on your polishing cloth—it is dead pigment, and is not a sign of damage.

CLEAN YOUR OIL PAN

Water always accumulates in the crankcase in winter. The wise way is to buy a set of oil pan gaskets, then drop the oil pan and give it a thorough cleaning. Clean gasket surfaces on both oil pan and engine block. Coat oil pan gasket surface with shellac, and, when tacky, place gasket on pan. Install all pan bolts before tightening any of them, to allow for movement in aligning bolt holes in engine block. Replace your oil filter at this time, too, so your new oil will have a fresh, clean start. Clean oil makes rings, bearings, and bearing surfaces last longer, and makes your driving a lot more fun.

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Late model cars and trucks operate at higher engine speeds and higher combustion temperatures. Sealed Power KromeX Ring Sets are built for those conditions. Top compression ring and steel rails of oil ring have solid chrome faces to fight heat, friction, corrosion, abrasion! Write Dept. H-5, Sealed Power Corp., Muskegon, Michigan, for your free copy of the valuable new booklet, "More Power, Less Oil, Less Gas."



How Your Shape Shapes Your Life

[Continued from page 119]

Alcohol accentuates his aggressiveness. When troubled he has recourse to action—he takes a long trip in his car, builds something, goes on a spending spree. For him the best time of life is the strenuous period of youth. His sexual drive is greater than the fatty's, but less than the nervous ectomorph's.

● The extreme nervous type is restrained in posture and movement; he is round-shouldered when standing or sitting; he walks as though he were treading on thin ice. He loves to be alone.

Although his health is quite good, he worries about it constantly. He doesn't want to reveal his emotions to others in an obvious fashion. As a result, he is often misunderstood. He lacks poise in social situations. His inhibitions prevent him from being free and easy. Small, closed-in spaces make him feel at home. He is more concerned with his own mental life than he is with what goes on in the outer world.

Alcohol makes him feel more strained and miserable. When in trouble he needs solitude. The ideal time of life to his way of thinking is maturity or old age—periods when he hopes to be more free from nervous tension and emotional insecurity, and to understand better the enigmas of human existence. His sexual drive—believe it or not—is very high.

Traits Match Build—or Else

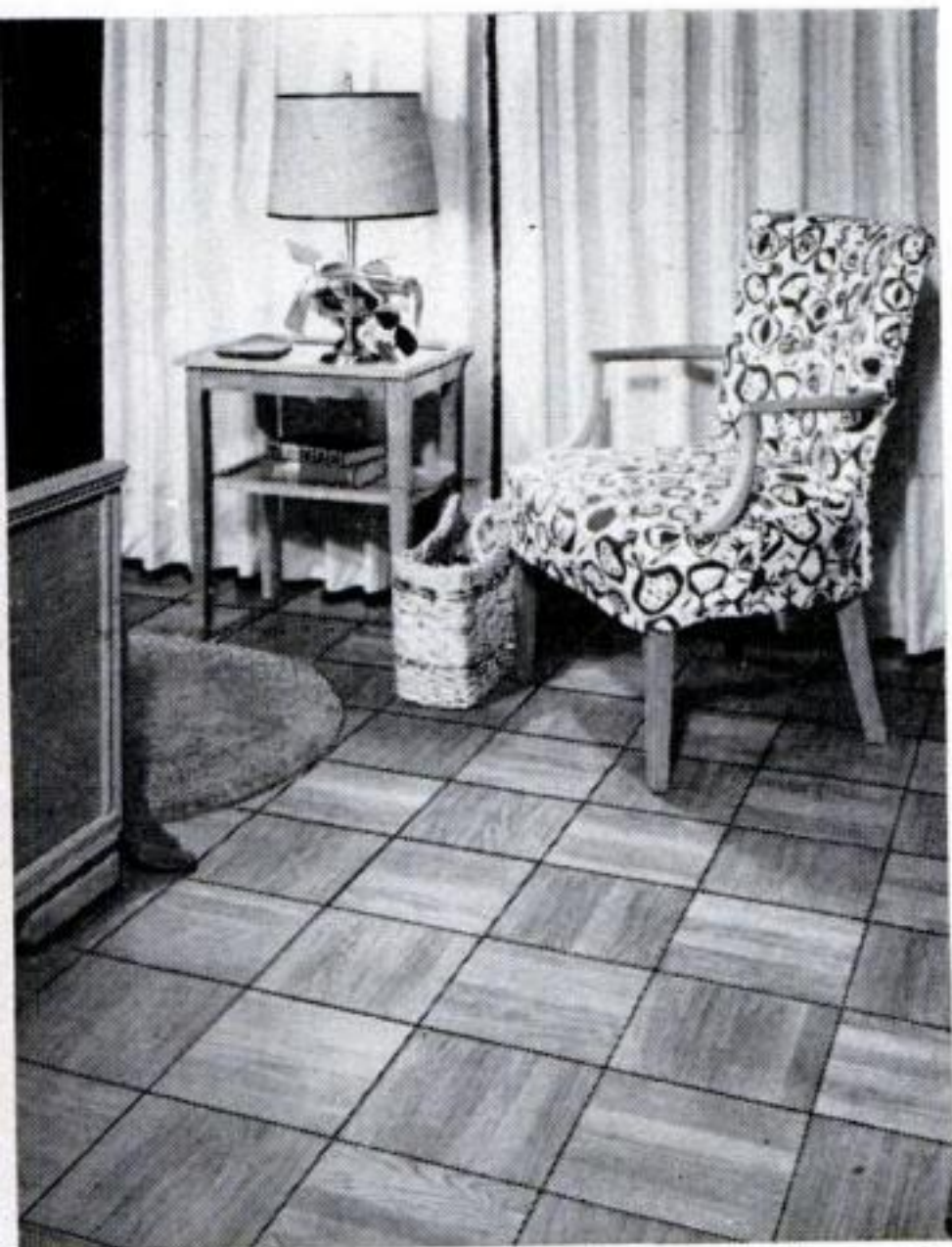
These, of course, are thumbnail sketches of *extreme* cases of each type. Most of us are not extreme cases. You are much more likely to be a 4-4-4 than a 7-1-1.

In developing this scale of temperament, Dr. Sheldon observed the persons to be rated for at least a year in as many different situations as could be arranged. He conducted a series of 20 or more analytic interviews of one hour each. Each trait was rated on a seven-point scale, and the rating was revised repeatedly. Finally, an index of temperament was computed for each individual.

This index number may be identical with the somatotype number. If there is a difference for any one component, it will usually not be more than one point. A man may be rated 5 for his muscular build, for example, and 4 or 6 on the temperamental expression of this component.

[Continued on page 230]

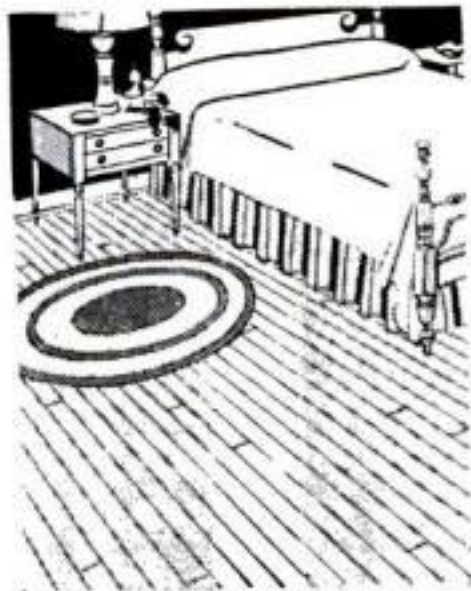
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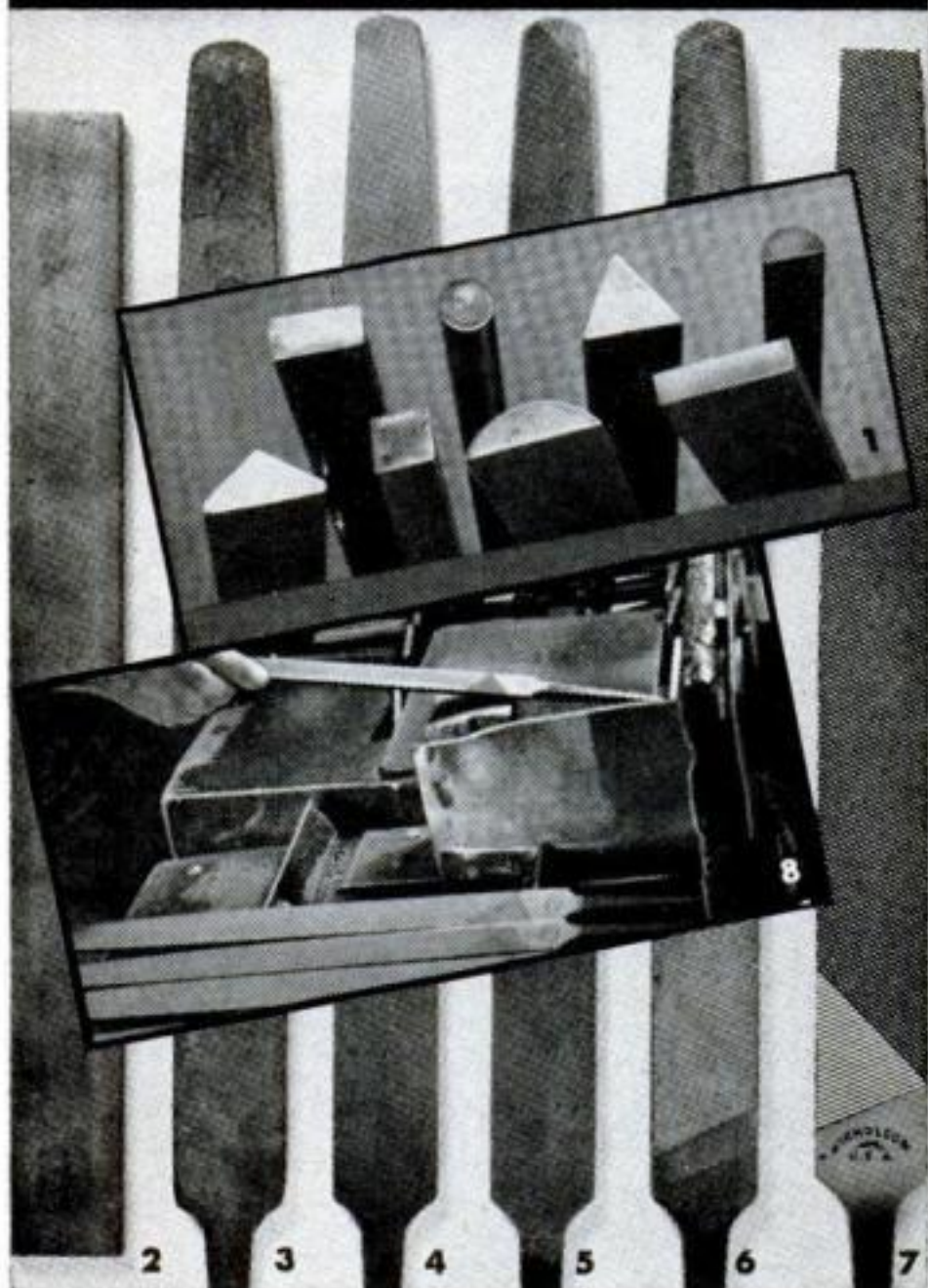
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A FILE FOR EVERY PURPOSE

How Your Shape Shapes Your Life

[Continued from page 228]

A difference of two points means that the individual is trying to be something other than himself. A very fat boy, for instance, may set his heart on being the world's heavyweight boxing champion. In consequence, he is living under a very severe strain.

Tailoring a House to a Man

Dr. Sheldon's classification can be applied to the study of human beings in many fields.

Furniture makers and decorators, for instance, would do well to remember Dr. Sheldon's comments: "The endomorph likes soft, overstuffed furniture, deep abyss-like chairs, inner-spring mattresses, luxurious general furnishing, and ceremonial eating equipment. The mesomorph craves spacious rooms without the overstuffing, and the ectomorph gravitates toward closed-in places and is content with a hard simplicity of furniture. Ectomorphs need chairs with high shallow seats which slope backward. They also appear to like stiff mattresses."

Architects can pick up a few pointers, too. The skinny nervous ectomorph does *not* want his house perched on a hill or on other prominent ground. He desires a hide-away in a valley or a hollow, or at least in the middle of protective greenery. Persons of this type "want small, snug houses with steep roofs and with attics and cellars." But the muscular mesomorph has a yen for a large home in an open place, preferably on a hill.

In medicine, studies indicate that certain constitutions are particularly susceptible to certain physical diseases. Mental diseases, according to Dr. Sheldon, are also closely associated with physical types.

Your Body Affects Your Job

A man's career and his body type, it has also been found, are definitely interrelated. Two Harvard scientists, Frederick L. Stagg and Prof. Earnest A. Hooton, have recently demonstrated this by applying Dr. Sheldon's classification to 2,631 Harvard graduates of the classes of 1876 to 1912.

They found that muscles are very important in engineering. If you aren't well muscled, the chances are that you'll drop out of engineering and go into some other line of work. The fellow with a superior

[Continued on page 232]



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[AND MAN, HOW THEY'VE ORDERED IT]

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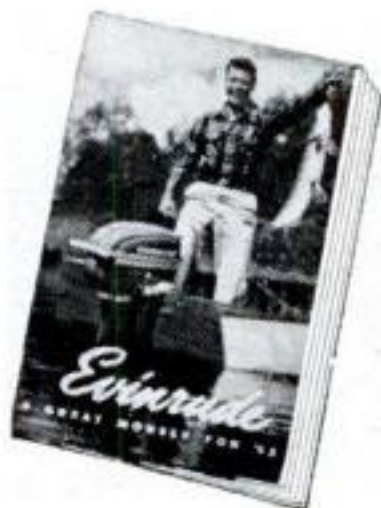
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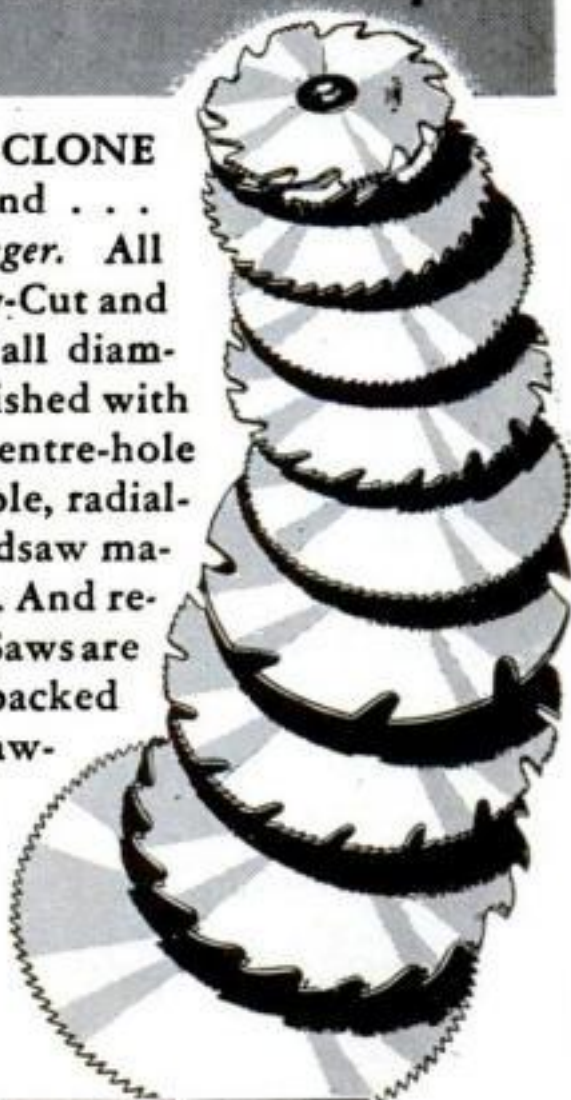
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How Your Shape Shapes Your Life

[Continued from page 230]

set of muscles has an advantage not only in engineering but also in science and business. Muscles are not so important, however, for lawyers, government officials, clergymen or artists.

During World War II, Dr. Sheldon studied pilots in the Army Air Forces and found that those who did best were mostly muscle men. He compared 200 high-ranking graduate fliers with 200 men who washed out early in primary training. He found that 76 percent of the successful group, but only 28 percent of the failures, were muscle men. In comparison, muscle men on a typical college campus make up only 38.5 percent of the male students.

The successful general, businessman or politician, according to Dr. Sheldon, is most often a man who has plenty of courage and is low in inhibitions—a muscle man, with a minimum of nerves. A fatty can try to sell hardware, but he'll probably accomplish more in the restaurant or entertainment fields. A muscle man may do fairly well as a civil servant, but he'll be likely to do better in professional sports or in the armed forces. A nervous type may be adequate as a general medical practitioner, but the chances are he'll be more than adequate as a research man.

Science from Common Sense

What is the basic significance of Dr. Sheldon's work? "Up to the present," says Aldous Huxley, well known British writer, "all the systems in terms of which men have attempted to think about human differences have been unsatisfactory." Each of these systems has suffered from one or more major defects: it has considered mind apart from body or vice versa; it has ignored exact measurement; it has had no significant relationship to everyday human behavior. Against this, Dr. Sheldon's work stands out, as Huxley says, as "a classification system more adequate to the facts and more potentially fruitful than any devised hitherto."

Dr. Sheldon and his coworkers thus have fashioned, in a quarter of a century of measuring how people look and how they act, a scientific tool for applying what is good common sense: That the man most likely to succeed is the one who picks a career which emphasizes his strong points and minimizes his weak ones.

END



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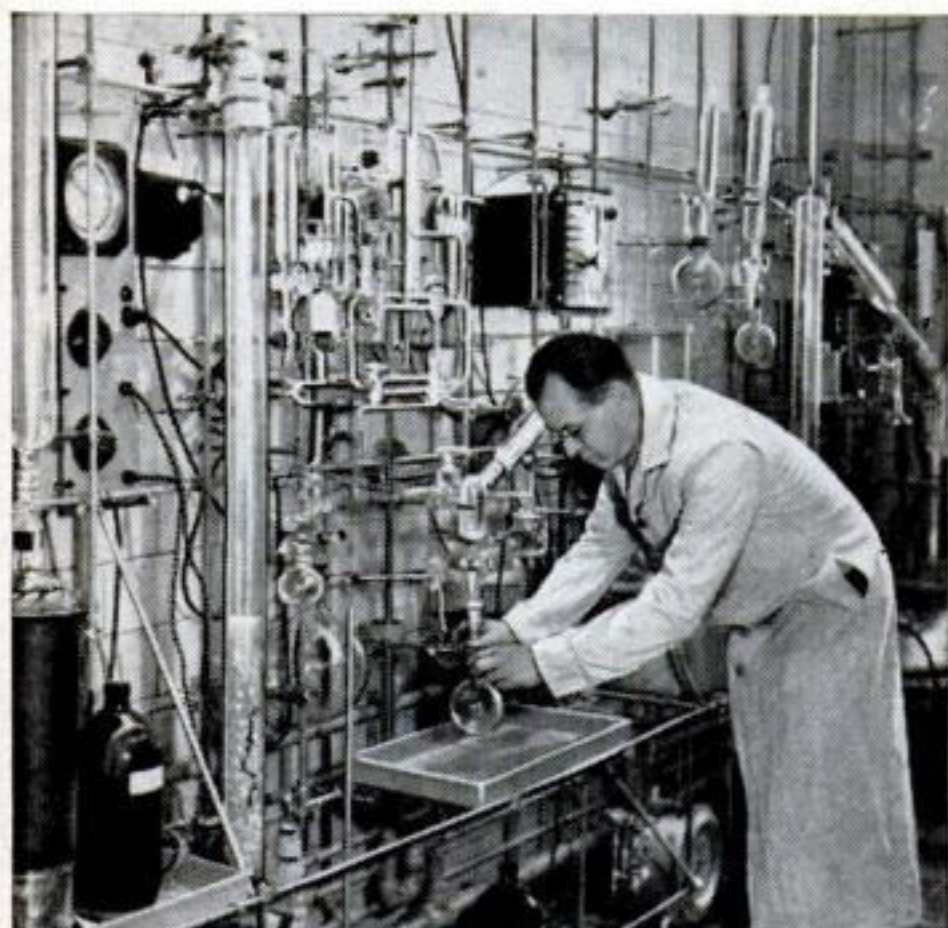
SPARK PLUGS

These Great Laboratory

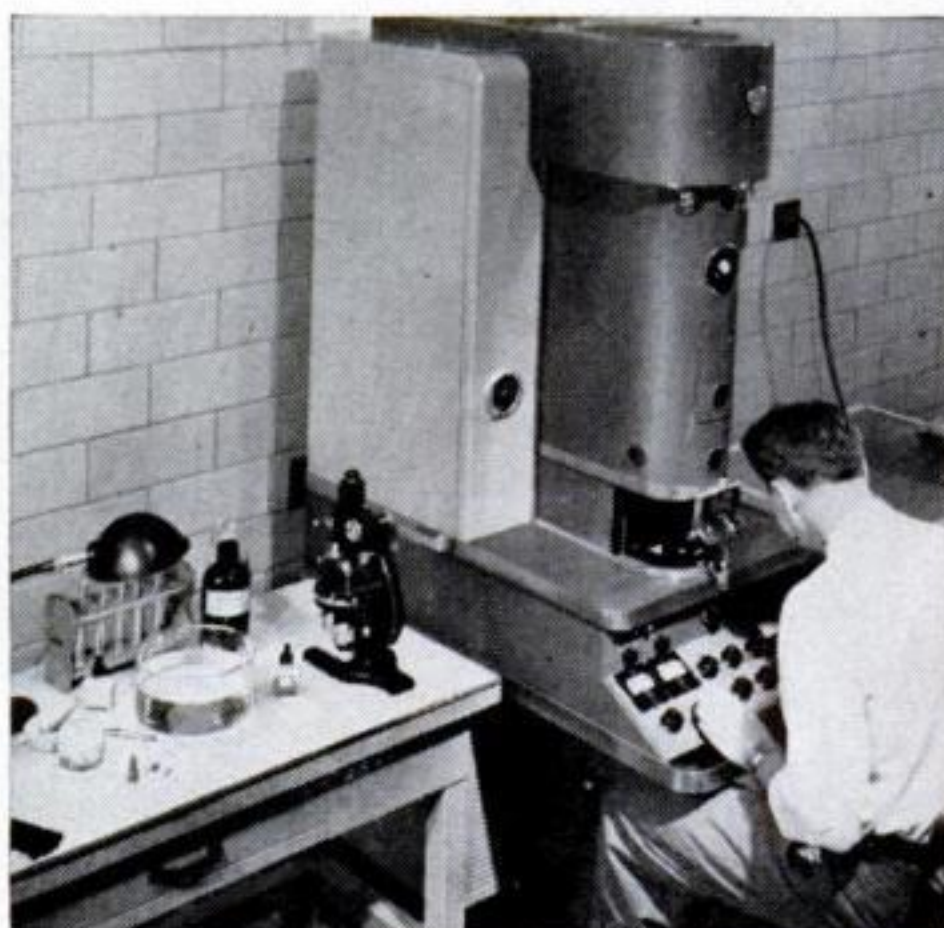


PETROCHEMICALS offer independent inventors great opportunity. Such synthetics as Nylon, Vinylite, Neolite are already indispensable to our expand-

ing economy—and new ideas in this area are at a premium today. If you have such an idea, the Sinclair Plan may help you develop it.



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Many inventive people have responded to the Sinclair Plan's offer of laboratory facilities—to others who wish to do so, a suggestion: There is promise and profit in oil-based synthetics.

EIGHT months ago, Sinclair turned over a part of its great laboratories at Harvey, Illinois, to independent inventors who had promising ideas in the field of petroleum products but who did not have the facilities needed to develop or prove out their ideas.

To date nearly 5,000 people have submitted ideas to the laboratories, and the Plan is recognized as a valuable service to independent inventors. As a result we have made the Sinclair Plan part and parcel of the long-range operation of our company.

There may be inventive people interested in this Plan but wondering what sort of ideas or what areas would be profitable to explore. *To those people we suggest the field of petrochemicals. Such things as plastics, synthetics and new materials made from petroleum offer great opportunities for invention and reward.*

If you have an idea of this sort—or in the general area of petroleum products or applications—you are invited to submit it to the Sinclair Research Laboratories. In your own interest,

each idea must first be protected by a patent application or a patent.

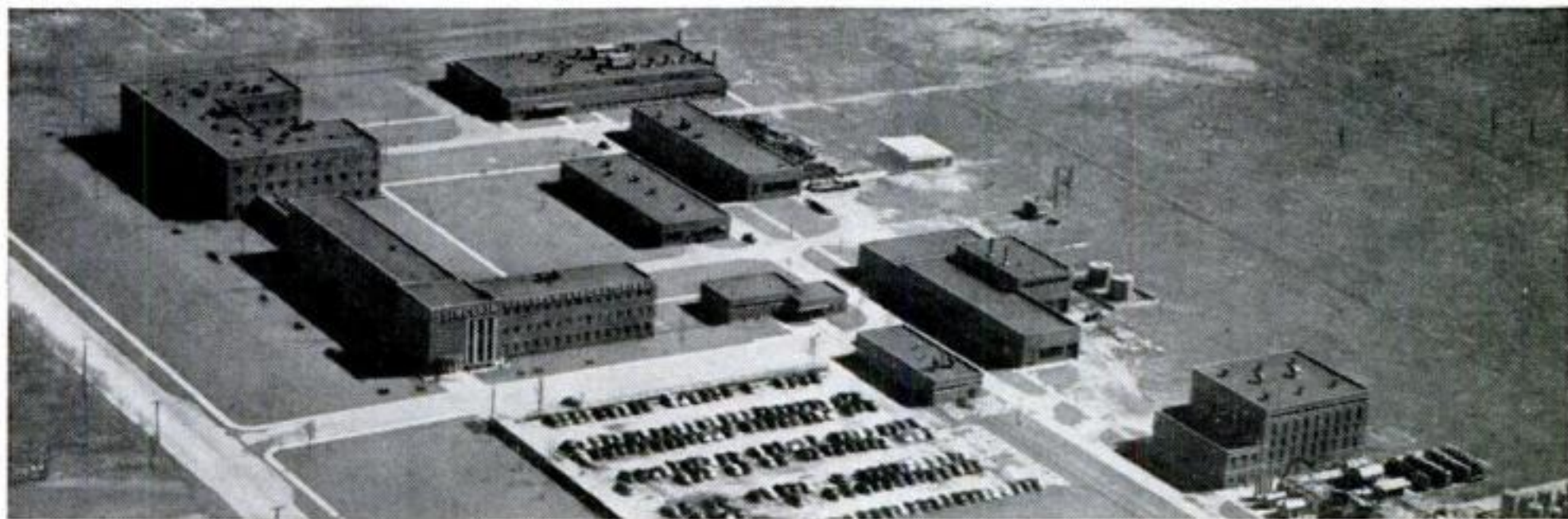
The inventor's idea remains his own property

If the laboratories select your idea, they will make a very simple arrangement with you: In return for the laboratories' work, Sinclair will receive the privilege of using the idea for its own companies, free from royalties.

This agreement in no way hinders the inventor from selling his idea to any of the hundreds of other oil companies for whatever he can get. Sinclair has *no control* over the inventor's sale of his idea to others, and has *no participation* in any of the inventor's profits.

HOW TO PARTICIPATE: Instructions are contained in an Inventor's Booklet available on request. Write to: W. M. Flowers, Executive Vice-President, Sinclair Research Laboratories, Inc., 600 Fifth Avenue, New York 20, N. Y.

IMPORTANT: *Please do not send in any ideas until you have sent for and received the instructions.*



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Down the Alaska Highway on a Scooter

[Continued from page 124]

His sleeping bag zipped up so that only his mouth, his nose, his eyes and part of his cheeks were not covered. He usually slept straight through, from dark till seven or eight a.m. when the sun would be high in the sky. Then he would roll up the bag, lash it on the scooter and start off again.

Some animals that he saw—moose, foxes and such—broke the loneliness. Others that he did not see he thinks were watching him all the time, day and night. "Whether you see them or not," he says, "they're there."

Alaskan Bears Are Fast

He feared two animals: "A bear with cubs or a cow moose with a yearling. These are vicious." He was out in the open on the scooter, not protected by a steel automobile body. He carried no weapon. He did not think he could outrun bears on the scooter because he had heard that Alaskan bears have been clocked at 40 miles an hour.

Bulstrode got to the southern end of the Alaska Highway, at Dawson Creek, B.C., 1,523 miles from Fairbanks, on August 14, after 12 days of travel that averaged 126 miles a day. He had become the first man to ride the Highway on a scooter. He was sure of it because the natives along the road obviously had never seen a scooter before. He had proved the ruggedness of his tiny vehicle.

Hard-Surface Road at Last

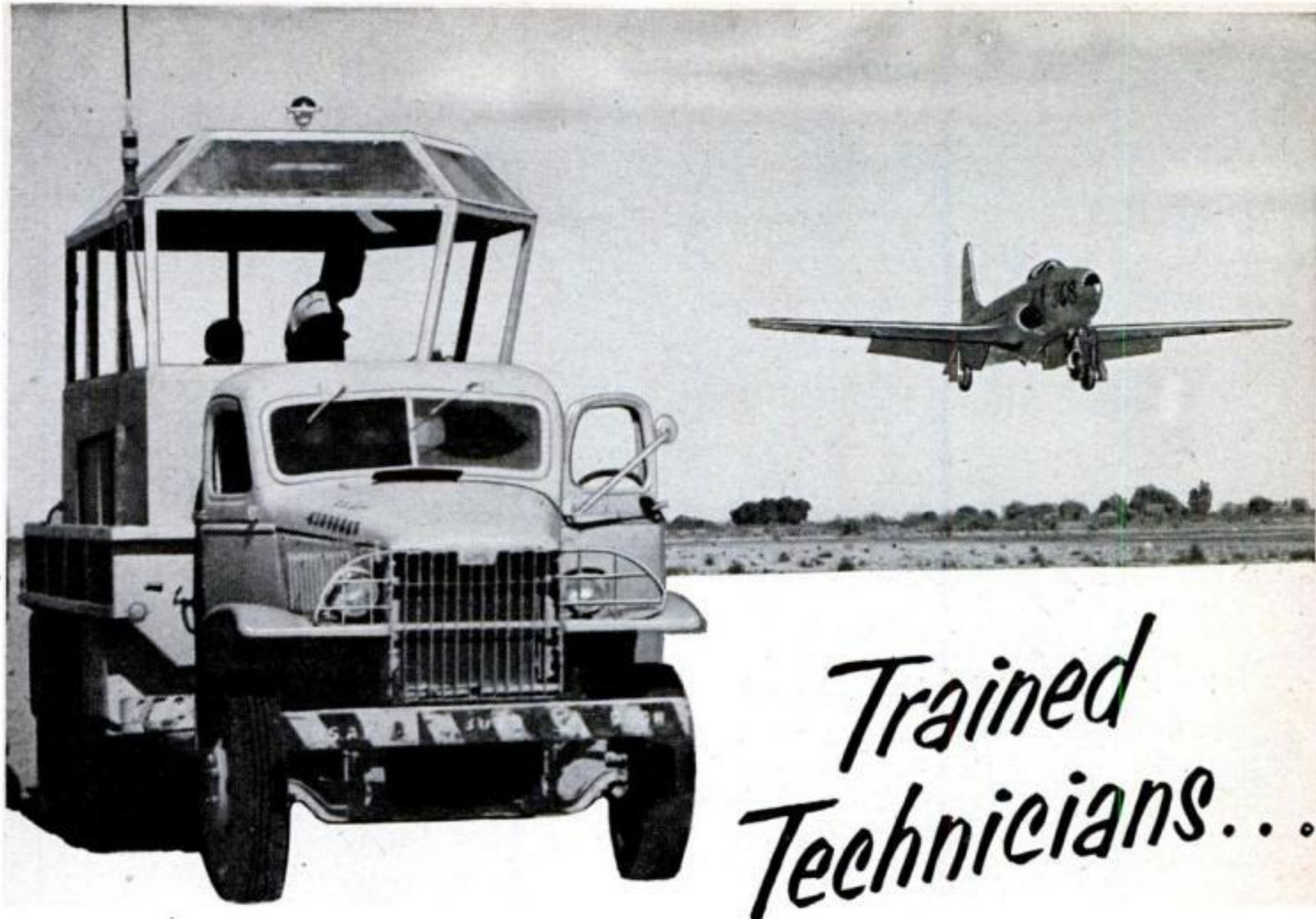
He had not had a flat tire. He had thrown the chain on his scooter several times when rocks got caught under it, but he had had no engine trouble. "I kept it well oiled and greased."

Although Dawson Creek was the end of the Alaska Highway, more miles of dirt road were ahead. Twenty miles north of Edmonton, Alberta, he at last reached hard-surface road—the first he had seen. "I was happy," he says. "I sat on that scooter crosswise. I could ride it any way. I no longer had to lash myself to it."

He entered the United States at Sweetgrass, Mont. He was now about four weeks from Fairbanks and his beard had grown. It had helped keep his face warm, but it had not kept his face from being chewed up by the dirt and gravel and wind.

There was another untoward develop-

[Continued on page 238]



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Down the Alaska Highway on a Scooter

[Continued from page 236]

ment. The beard provided a warm home for insects that got caught in it. The most common insects in his beard, he says, were called *no-see-ums*, a bug you cannot see individually because there are so many of them. They bit. Mosquitoes also cuddled up in his beard.

Visit from a Rattlesnake

At Havre, Mont., he went to see a barber about his beard. The barber used clippers and then, with special attention to the torn-up condition of Bulstrode's face, shaved it off. His dark hair, because he could never keep a hat on, had turned straw-colored.

In North Dakota one night a rattlesnake slithered along his sleeping bag. One morning—again in North Dakota, and again in the sleeping bag—something struck him in the middle of the forehead. He thought it was a rattler and was disconcerted when he realized he couldn't suck the blood from a wound in the middle of his forehead. He cut the wound open, and squeezed it like fury. Then he saw a big bee. He thinks it was the bee that stung him.

Speed on the Homestretch

On concrete U.S. highways he got the scooter up to 55 miles an hour—his top speed. Now he sometimes rode at night. He rolled on across South Dakota, Nebraska, Iowa, Illinois, Indiana, Ohio, the peak of West Virginia, Pennsylvania, New Jersey, then into New York.

Despite his speed on these roads, it took him more than six weeks to get to Long Island from Fairbanks. His brother, who had left Fairbanks by car a day ahead of him, had arrived home four weeks earlier.

Bulstrode says he didn't feel tired from the six weeks of scooting when he got home. He did, however, find it pleasant to sit quietly around the house for two weeks.

END

Next Month. *Huck Finn wouldn't know the Mississippi now, with radar-eyed Diesel tow-boats plying the stern-wheelers' routes.*

Eat Appetizer Last!

You should have an appetizer toward the end of a meal instead of at the beginning, according to flavor expert Ernest C. Crocker. It's then that the taste buds begin to tire and need added stimulation.

GOOD-BYE TO THIS COST!...GOOD-BYE TO THIS WORRY!...GOOD-BYE TO THIS DANGER!



1 **Paying Out \$10 to \$30 A Month** for "little" engine repairs? Burning up dollars — in gas and oil? Then you're *paying* for a WIZARD-IZED Engine.

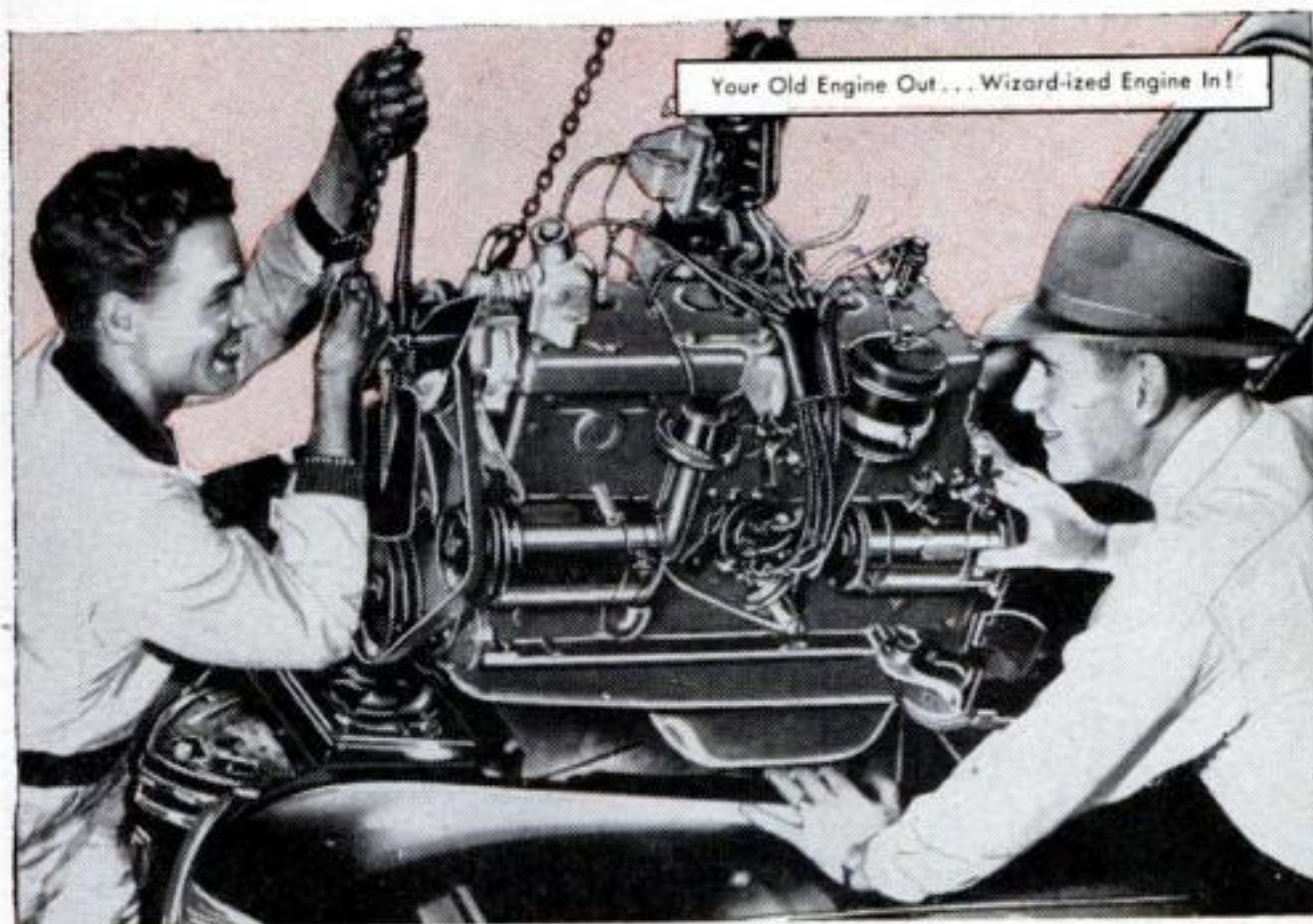


2 **Afraid To Take Your Car out** for fear the engine will "konk-out"? Put your money in a WIZARD-IZED Engine — not in towing and repair bills!



3 **Engine Too Sluggish And "Old"** to provide the power to pass other cars safely? Your repair money could pay for your WIZARD-IZED Engine!

Now You Can **"NEW-ENGINE"** Your Car For About The Price Of An Overhaul!



Instead of merely overhauling, "new-engine" your car this easy WIZARDIZED way — for about what you'd pay for an overhaul. Expert installation by trained me-

chanics in fully-equipped garages. And your old engine is worth a generous **guaranteed** trade-in allowance. See your Western Auto man — now!

And A Factory Remanufactured
Wizard-ized Engine
Has A New Engine Guarantee!

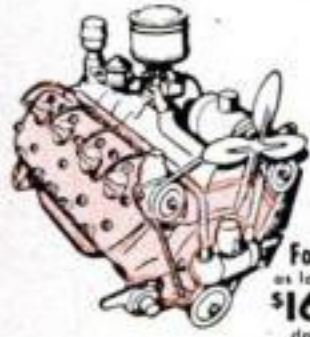
That's right! Why pay \$150 to \$180 for a bearing-ring-and-rebore overhaul, and have all the other "tired" old parts left in your engine?—when the same money can buy you a completely remanufactured Wizardized Engine? Why take 10,000 to 15,000 engine miles for your money—when you can get up to 50,000 miles or more.

Here's what we mean by remanufactured: It is not just your old engine, overhauled and put into your car! Your Wizardized Engine is precision remanufactured, using original factory block, in one of five large factories that handle no other work. Every part meets new-engine tolerances.

Every moving part is brand new or fully remanufactured to function like original equipment.

NEW CAR ENGINE GUARANTEE—backed by Western Auto, the most trusted name in auto parts—plus free 500-mile inspection!

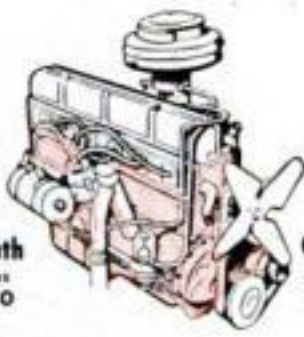
SO BEFORE YOU BUY any overhaul, see how much more you get in a Wizardized Engine!



Ford
as low as
\$16.00
down



Plymouth
as low as
\$17.00
down



Chevrolet
as low as
\$14.00
down



(Terms vary by area, make, and model of car)

Wizard-ized Engines

FACTORY REMANUFACTURED

The Engine You Can Buy with New Car Confidence!

For location of your nearest Western Auto Store, write **WESTERN AUTO SUPPLY CO.**, 2107 Grand, Kansas City, Mo. © 1952

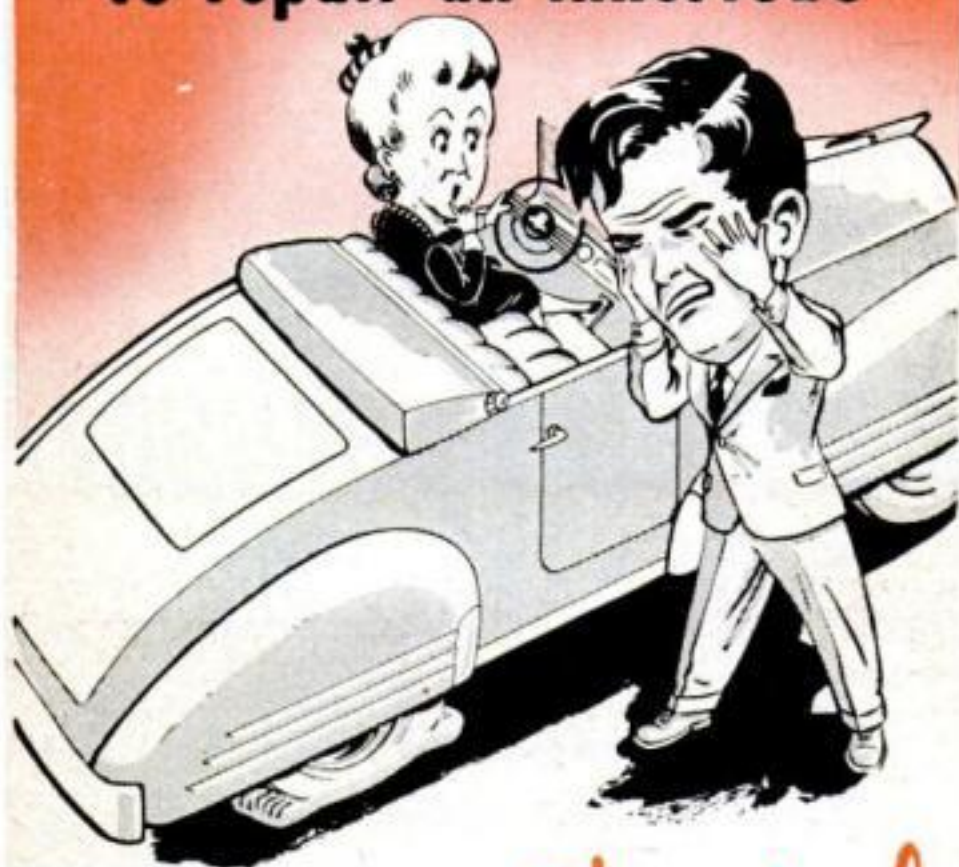
Sold
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WESTERN AUTO
STORES & ASSOCIATE STORES

NOTE: Western Auto Associate Dealers own their own stores and set their own prices, terms and conditions. Prices may vary due to differences in local conditions. (P852)

MAY 1952 239

There is **ONE**
SURE, SAFE Way
to repair an innertube



BOWES Chemical **PROCESS** **TUBE REPAIR METHOD**

● There are other methods of tube repair . . . the "cold patch" . . . the "vulcanized patch" . . . and . . . in most cases they work—but

**If You Want the ONE SAFE,
SURE METHOD . . . Drive In
Where You See BOWES
This Emblem . . .**



● When you go to a station that displays the BOWES emblem, you are assured of *Sure, Safe* Tube repairs by the BOWES Chemical Process tube repair method.

Don't take chances . . . look for the BOWES emblem and be **SURE** of **SAFE** tire repairs.

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, IND.

240 POPULAR SCIENCE

Gus Diagnoses the Flat-Tire Case

[Continued from page 180]

volved—the right rear and your spare, which you've switched back and forth each time you've gotten a flat."

"That's right."

For a few minutes Gus just stood there sucking on his pipe.

"Well," Barnstable snorted impatiently, "if you've no more bright ideas I'll be on my way and you can bet that little Rodgers scamp will have to answer for his pranks."

"Hold it a minute, Silas. About these valve caps of yours. You've only got four?"

"Yep."

Gus reached down and unscrewed the cap on the right rear tire. "Where'd you buy this cap?"

"Well—uh—" Barnstable hesitated, embarrassed. "I didn't."

"What do you mean, you didn't?"

"Well, I just happened to see some old valve caps in that junk box of yours a few days ago and I borrowed a couple."

For the next few moments Gus couldn't talk, he was laughing so hard. "Well, you borrowed yourself three flat tires in the bargain," he came out finally, still chuckling. "Take a look." There, wedged in the top of the valve cap was a small lock washer.

Silas Swallows His Pride

"You just happened to 'borrow' a valve cap that just happened to have a lock washer jammed up in it. Every time you put it on a tire valve, the washer pushed the valve stem down a bit and prevented you from screwing the cap down more than a couple of threads. The combination of a slow valve leak and a cap that wasn't screwed on tight added up to flat tires."

"Humph," grunted Barnstable, staring fixedly at the ground. "Guess maybe I owe you an apology and—" he swallowed audibly, "a little something for your time."

"Forget the apologies and the money," said Gus cheerfully, digging the lock washer out of the valve cap with his screwdriver and handing the cap back to Barnstable. "But I think it might be a good idea if you stopped in town and bought young Dick Rodgers a new baseball. I noticed this morning that the one he has is kind of beat up . . . And Silas," Gus warned, "no bargains this time—get the boy a good one." **END**

Next Month: Gus cures the mysterious cough afflicting a European road-racer.

Get the most for your money

INSTALL YOUR OWN KENTILE FLOOR



HERE'S America's most popular floor-covering for homeowner installation... low-cost, easy-to-lay, long-wearing. Dirt and stain-resistant... gleams like new with occasional, no-rub waxings. Don't make the mistake of buying floor-coverings with just a colored surface that wears off with use. Kentile's 26 wear-proof colors go right through each tile—its durability is assured by this written guarantee. (If you prefer, your Kentile Dealer will install your floor.)

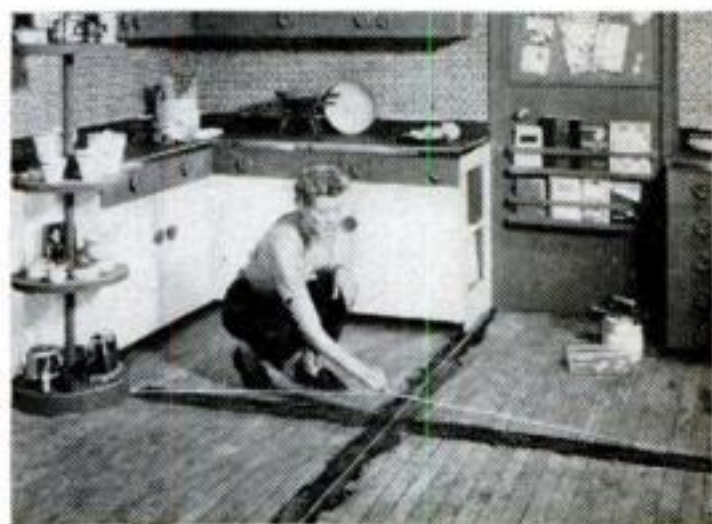
Only Kentile Dealers offer you these low-priced Guaranteed Kentile Floors

*Price quoted is for a Kentile Floor approximately 9' x 10' installed by you. Your Kentile Floor may cost less or slightly more, depending on size of room, colors and freight rates. See your local Kentile Dealer... he's listed in the classified phone directory under FLOORS. In Canada, T. Eaton Co., Ltd.

Write for your FREE Kentile Color Book showing all the colors of low-cost Kentile and easy-to-follow instruction booklet

KENTILE, INC., 58 2nd Ave., Dept. H-7, B'klyn 15, N. Y.

Mrs. William A. Loock Jr. shows you how easy it is to install long-lasting Kentile



Here Mrs. Loock is finding the center of the floor. Next, she'll spread Kentile Adhesive over half the floor before laying the tiles in place.



With half the floor installed, Mrs. Loock spreads Kentile Adhesive to cover remaining half. Then it's simply a matter of putting tiles in place until entire floor is completed.

KENTILE®

The Asphalt Tile of Enduring Beauty



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Fancy Cuts**

**Like an
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ROUTER

only \$49.50

**Do Coving • Veining • Dadoing • Fluting • Rabbeting
Inlaying • Beading • Dovetailing • Make Cut-
Outs • Raised Decorations • Molding • Relief Work**

Now—make all the fancy cuts required in furniture, cabinet, built-in and molding making. Portable Guild Router is a professional tool priced for the home craftsman. Used extensively in woodworking shops because of its sturdy construction, extraordinary speed, hairline accuracy.

All these advanced features:

Depth adjustment from $\frac{1}{64}$ " to 1" • Exclusive True-Spin chuck, $\frac{1}{4}$ " capacity • Extra heavy thrust bearings • High polish, die-cast aluminum housing and base • INTERCHANGEABLE MOTOR . . . 20,000 RPM motor also powers Guild Plane and Shaper.

**Save \$89.50
on this Tool Trio!**

Start with the Guild Router complete with base and interchangeable motor for \$49.50. Unit becomes a high speed Electric Plane by adding Plane Attachment for only \$25.00. Then an accurate Shaper by adding Shaper Table for only \$24.00. You get all 3 tools for \$98.50—eliminate the cost of 2 motors—and SAVE \$89.50 on this great combination!

Guild Plane



**See your Guild Dealer — or
mail coupon for full details.**

**PORTER-CABLE MACHINE CO.
6185 N. Salina St., Syracuse 8, N. Y.**

Please send me complete information on Guild Router, Plane and Shaper . . . also name of nearest dealer.

Name _____

Address _____

City _____ Zone _____ State _____

In Canada, write: Strongridge, Ltd., London, Ont.

What Will They Think of Next?

[Continued from page 84]

ences, physiological sensitivity over various parts of the body, musical sense, Rorschach testing, artistic sense, speed of various perceptions, physical contour, ethical sense—and perhaps a hundred other vital questions and tests.

Compatibility to Be Determined

In addition to the questionnaire, the couple will undergo certain "linked" tests in close physical contact with each other, such as holding hands and kissing. This is an important test. There is a definite electric relationship between compatible and incompatible subjects, particularly between male and female individuals.

If the prospective marriage candidates have undergone all the necessary tests, the result will be added to the general questionnaire. All this information will then be transcribed by machine on special large punched cards. The prepared male and female cards will now be fed into a suitable electronic calculator—the so-called electronic brain—which will give the result in a matter of minutes.

Furniture May Have Heating Elements

Another advantage the future should bring is heat-conditioned furniture, in place of our present steam heat in the winter and air-conditioning in the summer.

There will be two different sets of electric elements in the furniture, one for heating, the other—an entirely different one—for cooling. The furniture will be cooled by the Peltier effect, discovered by that French researcher in the early 1800s. He observed that if a direct electric current is sent through a metal rod composed of bismuth and antimony, in the direction of bismuth to antimony, the point at which the two metals touch can be cooled below the freezing point. Thermostats on the furniture will enable the user to select the amount of cooling that suits him.

Finally, I predict that shortly we will have multiple-screen television sets. With a three-way screen people can group and disperse about a room in a normal manner rather than cluster like a swarm of bees.

The new type of set can consist either of three television image tubes, which is the more expensive way, or a single high-intensity television projector tube, already on the market, in conjunction with a three-way optical system.

END

Light Weight—only 73 pounds. The gas tank's built in, no extras to carry.

Proved Full Jeweled* Power Head—the same basic "Super 10" Hurricane powerhead that set the whole outboard industry on its ear . . . that outperforms engines of two and three times its rated horsepower.

Reverse Gear and Neutral—engineered right for outboard use. The shift lever's up front where it should be.

Twist Grip Synchronized Spark and Throttle with new longer steering handle for ease of control.

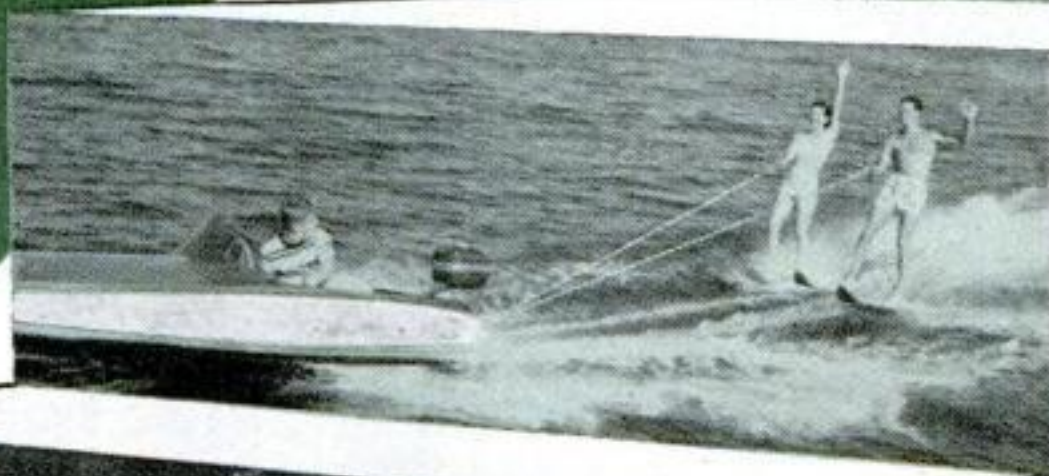
New "Power-Thrust" Lower Unit—for more efficiency with heavy loads. Unicast one piece gear housing keeps lubricant in—water out.

Plus—all the famous features that make every Mercury the leader in its class by a nautical mile. See your Mercury dealer for a demonstration.



The
outboard
that
has everything—
does
everything!

move up
to the new
KIEKHAEFER
**MERCURY
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performance! Now — take the whole family in a big boat at runabout speeds. Plenty of muscle to power cruisers and work boats but light enough for one man to handle.

water skiing — Power to spare — actually pulls two skiers up out of the water and over ski jump!



fishing — throttles down to a sweet slow troll but wings your party and gear home in a hurry.



Write for free illustrated catalogue "Move Up To A Mercury". Kiekhaefer Corporation, Fond du Lac, Wisconsin.

*Ball and roller bearings throughout. Features of Mercury Motors are protected by issued or pending patents.

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Assemble Your Own

BILT-WELL Nu-Style Wood Cabinets



Your local Lumber Dealer will assist you in the purchase of Bilt-Well Cabinets.



Anyone can assemble Bilt-Well Cabinets as all parts are prefitted. Cabinets fit directly to wall surface.



You can decorate Nu-Style Cabinets any color. Re-decorate them anytime.

Why wait to buy what you can have now by doing the assembling, the installing and the decorating yourself? Bilt-Well Nu-Style Cabinets are completely machined, pre-fitted, and ready to put together. Don't wait until you "save up" for a new kitchen, do it yourself and save. Sold by leading Lumber Dealers.

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Dubuque, Iowa

CARR, ADAMS & COLLIER CO. Dept. S/2
Dubuque, Iowa

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Address.....

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My Lumber Dealer is.....

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with

**BILT-WELL
WOOD WORK**

A PUSHOVER

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screws

It turns while you push—the "Yankee" No. 130A Spiral Ratchet Screw Driver speeds screws on their way—with ease. Quick-return spring holds blade in slot and returns handle after each stroke. See this and other handy "Yankee" tools on display at your dealer's. Write for "Yankee" Tool Book. North Bros. Mfg. Co., Dept. 5, 215 West Lehigh Ave., Philadelphia 33, Pa.



"YANKEE"
No. 130A
Spiral
Ratchet
Screw Driver

"YANKEE TOOLS
NOW PART OF

STANLEY
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Gasoline or Electric Type That
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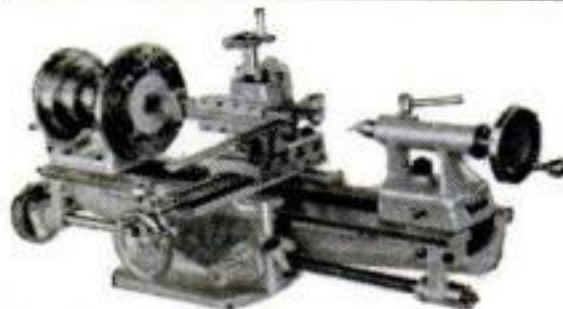
Save time and work cutting grass and weeds—Build a whirl blade power mower, cheaply without special tools or equipment. Send postcard for FREE building plans.

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Catalog with complete construction drawings of this 8 inch lathe with milling, grinding, shaper attachments, 25 cents post-paid, or send \$1 for drawings of three lathes, three milling machines and six inch crank shaper. Refund on castings order. **POOTATUCK CORPORATION, 104 Sammis Pl., Stratford, Conn.**



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\$3.95
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Amazing Fisher's Compression SEAL will put new power & zip into your car. Because of friction, engines lose compression, become oil burners. A small amount of Fisher's Compression SEAL in each cylinder bore. Expands 30 times; restores compression, stops piston slap, and reduces oil consumption accordingly. Old, tired engines may not need expensive overhauling.

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If after having driven 400 miles, you are not completely satisfied with the new performance and oil savings obtained from Fisher's Compression SEAL, return the used tube for a full refund. \$25,000 indemnity insurance policy is your assurance that it will not harm the finest engine. Only \$3.95 postpaid. Write for free folder. Easily installed, send cash, check or money order today. Dealer Inquiries Invited.

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GENERATING PLANTS

For COTTAGES • CAMPS • HOUSE TRAILERS • CONSTRUCTION • ROAD BUILDING, etc.
Plenty of emergency stand-by or general utility power from 350 watts to 25 KVA.



ITEM #183

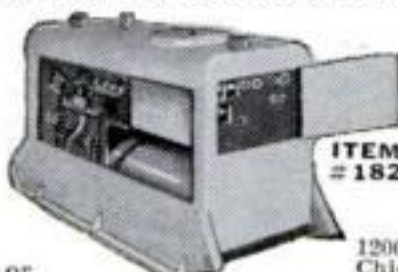
Item #183 — 3000 to 4000 WATT GENERATOR SET

FEATURES—Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS**—Size 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3,000 to 4,000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's Cost Over \$1,200.00. **SALE PRICE F.O.B. Chicago 465.00**



ITEM #199

Item #199—Power Unit PE-99—7.5 KW—120 Volt—Single and 3-Phase—60 Cycle A.C. Master generator driven by a 4 cylinder, V-type, air cooled, Wisconsin engine with magneto ignition, push button start. The self-excited, drip-proof generator is driven from 5 parallel V-belts. Control panel contains engine and generator instruments, including circuit breaker, emergency start-stop buttons, volt meter, ammeter. Complete semi-enclosed unit mounted on steel skid. Weight 1885 lbs. F.O.B. Chicago. **945.00**



ITEM #182

1200 lbs. F.O.B. Chicago. **795.00**

Item #178—350 watt—110 volt—60 cycle A.C. direct coupled to 1 cylinder Mideo engine. Shpg. Wt. 116 lbs. F.O.B. Chicago. **125.00**

Item #182—Onan Generator—5KW—120 volt—60 cycle A.C. single phase, direct coupled to Ford 4 cylinder, water cooled engine with push button start, battery ignition. (Battery not included.) Shpg. wt. **795.00**



Item #178



ITEM #180

Item #180—15 KW—127/220 volt—60 cycle AC—3 phase 1800 RPM. Brance & Krachy Generator direct coupled to International Harvester 4 cylinder, water cooled engine with magneto ignition—push button start. Panel has voltmeter, ammeter, 4-wire electrical system, belt driven excitor generator, rheostat voltage control. Engine and generator mounted on steel skids. Shipping wt. 2000 lbs. (Battery not included.) F.O.B. Chicago. **1650.00**

Item #201—PE 95-G—10 KW—110/220 Volt 60 Cycle A.C.—Single Phase. Totally enclosed, Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not incl.) Skid mounted. Ship. wt. 1500 lbs. F.O.B. Chicago. **1295.00**

Write for free information on other generators—350 watts to 25 KVA.

HEAVY DUTY HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8 1/4 lbs. **21.50**

ITEM #160—PESCO GEAR TYPE HYDRAULIC PUMP. Compact—Powerful—Reliable. Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for 3/4" holddown bolts. Standard 1/2" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 3 HP. Will actuate one item #6, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago. **22.50**

ITEM #127—Double acting hydraulic cylinder, 1" bore, 1" stroke, 1/4" diam. shaft, 1/4" tubing thread ports. Over-all length closed—6 1/2". Clevis mounting at both ends. Perfect for clamping and feeding. **5.95**

ITEM #16C—Double acting hydraulic cylinder, 1 1/4" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$55.00 value. Now only. **16.95**

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ITEM #42—Double action hydraulic cylinder 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Shipping weight 30 lbs. F.O.B. Chicago. An Excellent Buy for. **32.50**

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ITEM #29KJ—Gear Type Hydraulic Pump. Ideal in industrial applications and for operating all hydraulically powered farm implements including loaders, stackers, swathers, plows, etc. Delivers 1000 PSI (may be set at lower PSI if desired), 12 GPM at 400 RPM. Max. operating speed 800 RPM—rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting, 1" diam. shaft, 3/4" pipe tap inlet, 1/2" pipe tap outlet. Ship. wt. 22 lbs. F.O.B. Chicago. **45.50**



Item #130

GENERAL MOTORS — ALLISON

CENTRIFUGAL PUMP

Typical Performance Data

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

• For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering This General Motors Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counterclockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost \$145.00. F.O.B. Chicago. **39.50**

New Model 353 — Dual Range

D. C. ARC WELDER

for Stationary or Portable Use. **HEAVY DUTY RANGE TO 250 AMPS. NEW 'MAGIC TERMINAL' FOR LOW CURRENT 30 TO 100 AMPS. IDEAL FOR • FARM • FACTORY • GARAGE • WORKSHOP**

These precision engineered D.C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have oversized lifetime grease-sealed ball bearings, air cooled commutator, dial type rheostat for easy pin-point control, a highlow rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep, 7 1/2 HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps, 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Shipping weight 107 lbs. \$350.00 Value. Item #65. F.O.B. Chicago. Now Only. **119.50**



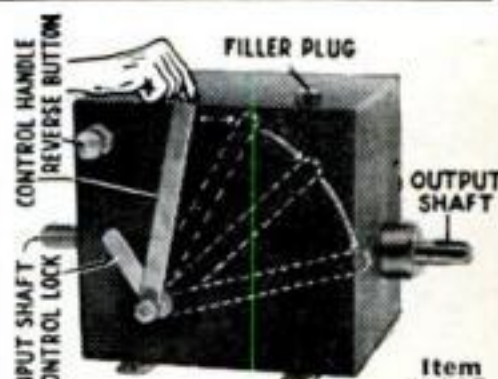
Welds Anything From Auto Fenders To Tractor Frames

HYDRAULIC SPEED REDUCER

With Fingertip Control

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Internal relief valves prevent overloading. Use input power of 1/4 to 1/2 H.P. This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure 3/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2"x7 1/2"x11 1/2". Gov't. acquisition cost, \$428.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**



Item #115

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You can build anything from a coffee table to a house with SKIL Home Shop Tools. SKIL Saws make fast work of ripping, mitering and beveling . . . Sanders give satin finishes quick . . . Drills and other SKIL tools take the drudgery out of building things. See your dealer—or mail coupon.



SKIL Home Shop Saw—Model 520. Accurate, powerful 6" saw. Quick, easy bevel and depth adjustments. \$59.50. SKIL Saw Table and accessories easily convert this saw to tilting arbo. bench saw, sander and shaper.

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Soapbox Racers Hit the Big Time

[Continued from page 106]

the inspection committee be doubtful about the car or the itemized price list submitted with it, the boy is asked about them.

One 11-year-old brought in such a sleek racer that the committee became skeptical that such a little fellow could have done the job himself. He showed 'em—went to the workshop in an Akron trade school and demonstrated what he could do.

Boys Have Big Week End

In Akron, the kids spend the four-day Derby week end in a camp outside the city. Besides a program of planned recreation and special outings, there's a chance for each boy to take a trial run down the track.

When the great day comes, the entries are lined up three abreast behind the starting line. Three cars race in each heat, and one is run off every 90 seconds, all afternoon. After three elimination rounds there are six cars left. These race in pairs in the fourth round, and the three winners of these heats race for the national title. The three fourth-round losers then run a special heat for fourth, fifth and sixth places. Other winners up to tenth place are picked on the basis of competitive times.

Worthwhile Prizes

The kids have something besides glory and handsome trophies to race for. The national championships are sponsored by the Chevrolet Motor Division and Chevrolet dealers. They provide a \$5,000, four-year college scholarship and a gold ring for first. Second place brings a Chevrolet sedan. The other winners share such prizes as cameras, binoculars, power tools and typewriters. There are also special prizes for the best built car, the best upholstered car, best designed car, best brakes, and the fastest heat. All Akron entrants get watches for winning their local elimination races.

On the day of the race, the stands are packed with spectators. As the noses of the first three are pushed gently against the baffles, the kids crouch down in their cars. The green flag is raised. The crowd is silent for a moment, then it roars as the flag drops and the three racers shoot down the hill.

No matter how the cars or the races change, there's one thing always the same—the excited small boy sitting in the driver's seat, gripping the wheel, wishing his racer down the hill with fierce intensity. **END**

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Sorter Funnel... close slot at bottom, dump contents into funnel... select item.

Sorter Funnel... open slot at bottom to return items to jar... no spilling.



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\$11.25

Sorter Openings... permit sorting of items without removing jars from rack.

Glass Jars... everything in plain view. No hunting for parts... no labels needed... no names to remember.

Slide-Away Jars... quick easy removal and replacement of jars in rack. No screwing or unscrewing... just slide away.



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I am enclosing my check in the amount of.....for the ☐ kit ☐ assembled
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☐ Please send me further information on the E-Z Find Handirack.
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Miracle Power Pres-A-Luber is ideal for car engines as well as general household lubrication. Just push the button for a fine Miracle Power spray that reaches all the hard-to-get-at places.



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How We Fight with Words

[Continued from page 152]

Voice of America officials estimated a year ago that the Russian people were hearing about 20 percent of what the U. S. intended them to hear. The latest estimate is that improved facilities and techniques have stepped that figure up to 40 percent.

More Receivers Needed

The entry of the *Courier* into the counter-jamming campaign may soon raise the figure further. Besides being able to shift its position at will, it is equipped with certain electronic devices for counteracting jamming, the details of which are secret.

It would, of course, be a great advantage to the free countries if they could place more radio receivers in the hands of the people behind the Iron Curtain. There was an item of \$2,800,000 in the original Voice of America budget for 1951—the one that Congress eventually cut 90 percent—which was intended to accomplish that. For friendly countries, it proposed to provide large sets to be placed in taverns, clubs, schools and other public gathering places. It also proposed to purchase radios "of pocket size and operating on powerful miniature batteries of radically new design," which were "to be smuggled into countries where radio listening is the rough equivalent of treason."

Many Ways to Smuggle

Sets of suitable size have been in existence for several years (PSM, March '48, p. 132). The principal barrier to their use has been their cost. But a year ago David Sarnoff of RCA said that he thought it was possible to make miniature receivers for as little as two dollars apiece and that he had RCA engineers at work on the project.

Smuggling them into Iron Curtain countries might be done by balloon, as Radio Free Europe delivered propaganda pamphlets last year (PSM, Oct. '51, p. 124), or by methods developed during World War II. Then, British planes dropped tiny sets to the Czechs in matchboxes. The Dutch hid them in cut-out books, lamps and women's powder dusters. They even slipped one into a Nazi prison camp in a can of vegetables.

END

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- 27x28 in. table, 13 1/2 in. capacity in front of blade
- 10 in. blade cuts 3 1/4 in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level

- New Departure ball bearing arbor, 3/4" precision shaft turned down for 5/8" bore blades, alum. housing, shipped ready to run
- Jackscrew and 4 1/2 in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade).....\$20.95
Same Kit with 10" Combination Blade\$24.90
Same Kit with 8" Combination Blade\$23.90

GIL-BILT 8-INCH TILTING TABLE SAW

- 21x27 in. table tilts full 45 degrees, 13 in. capacity in front of blade
- 8 in. blade cuts from 0 to 2 1/2 inches
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GIL-BILT Metal Parts Kit includes Plans, Ball Bearing Arbor, Miter Gauge and Bar, Rip Fence Guide, Machined Lock Knobs, Tilt Support Segments and All Other Metal Parts (less blade).....\$15.95
Same Kit with 8" Combination Blade.....\$18.90

GIL-BILT 12-INCH BAND SAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
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- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two 5/8" bore Oilite Bronze bearings

- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled
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- Uses standard 7/8 inch blades up to 3 3/4 in. wide
- Fully enclosed mechanism for utmost safety

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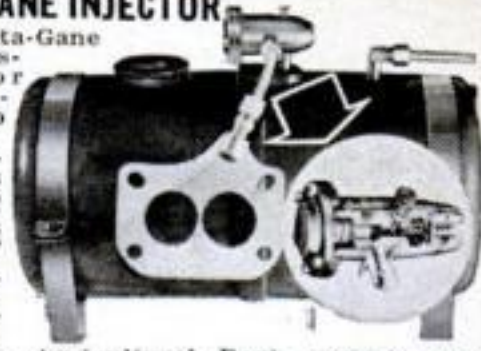
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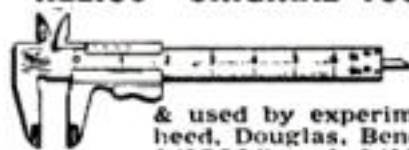
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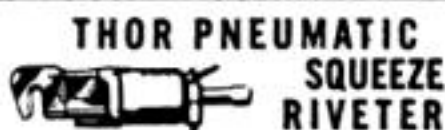
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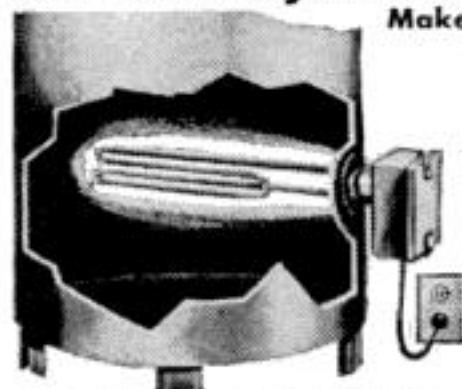


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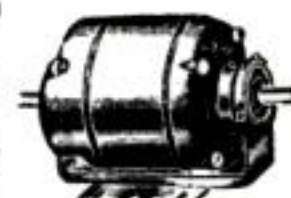
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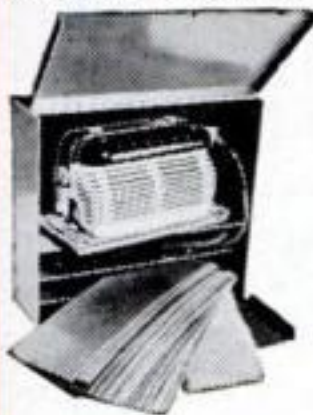
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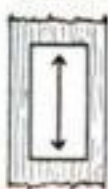
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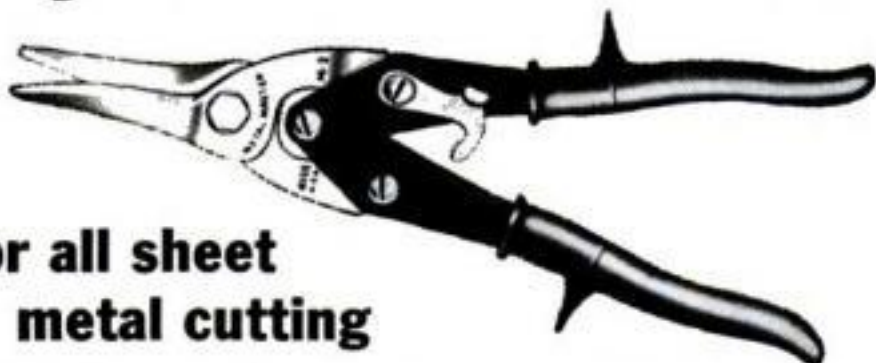
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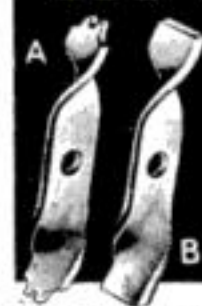
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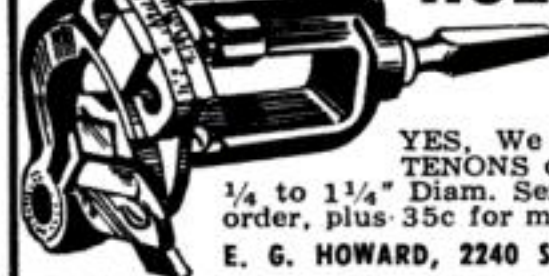
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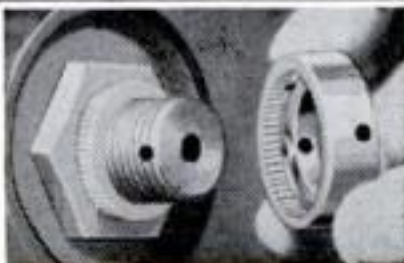
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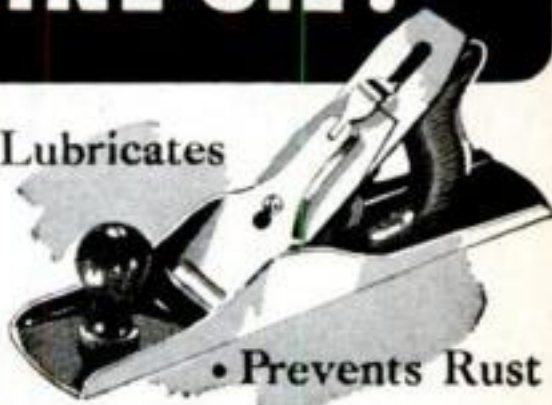
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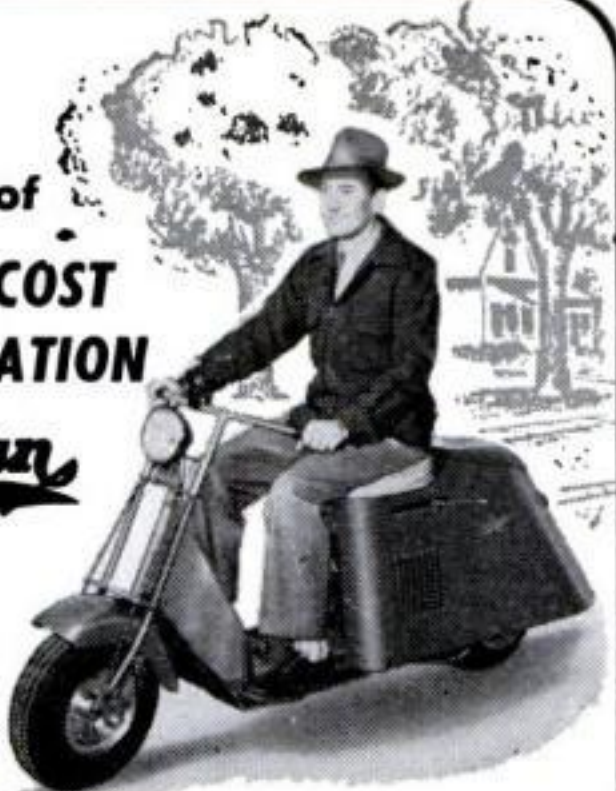


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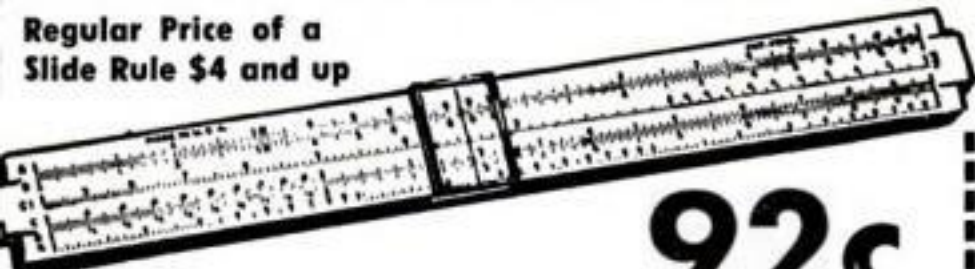
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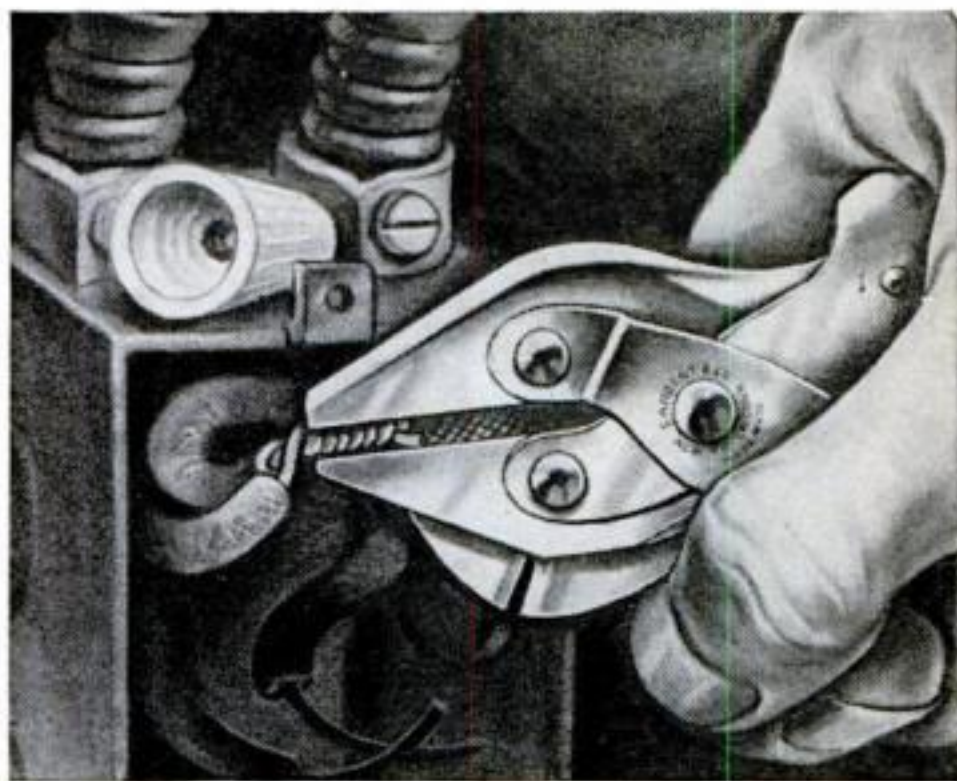
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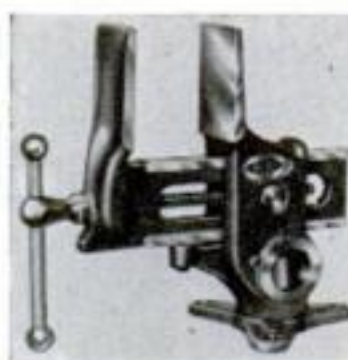
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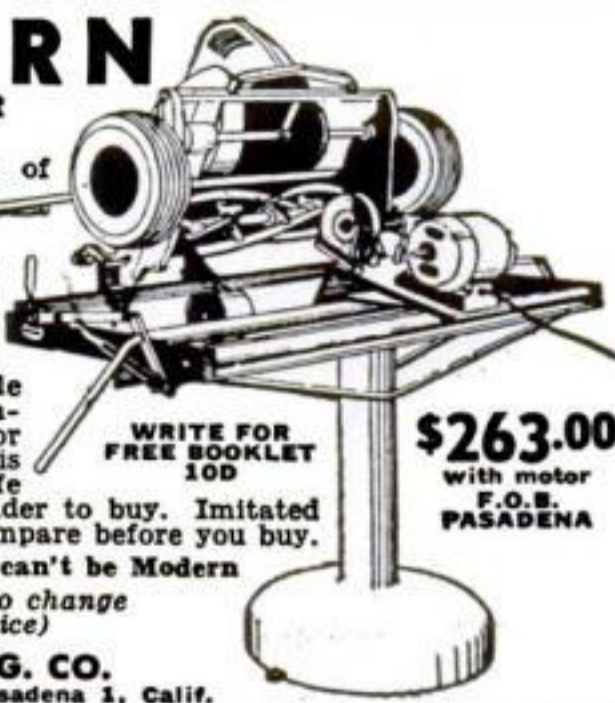
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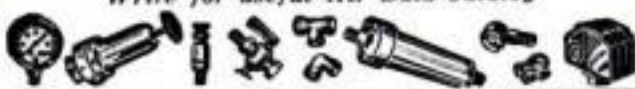
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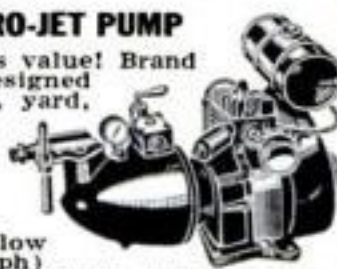
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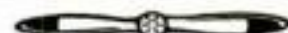
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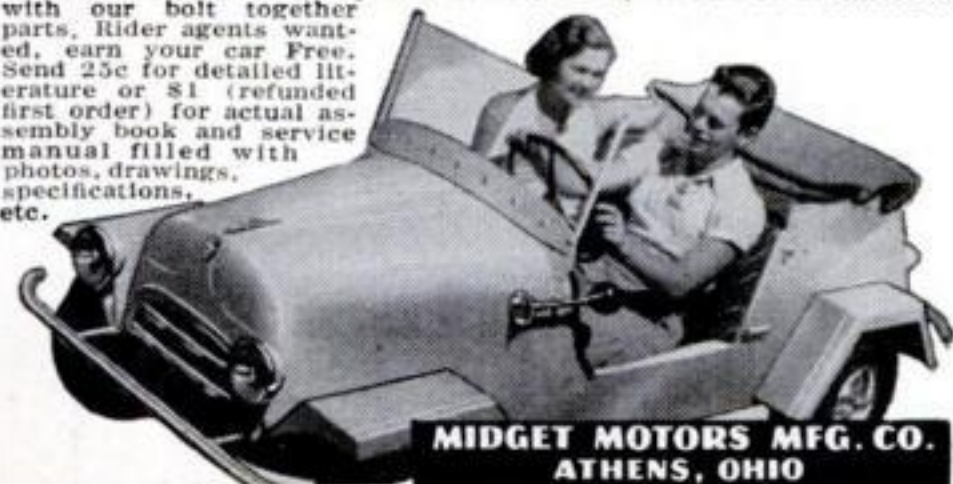
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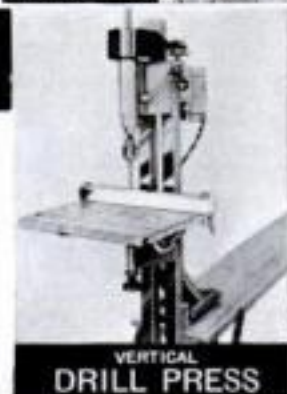
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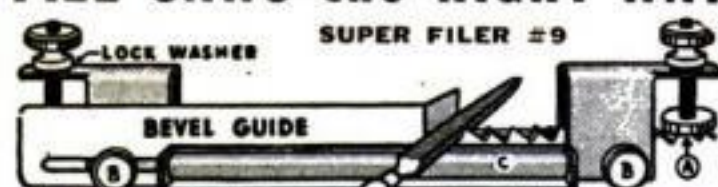
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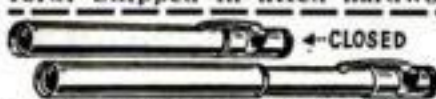
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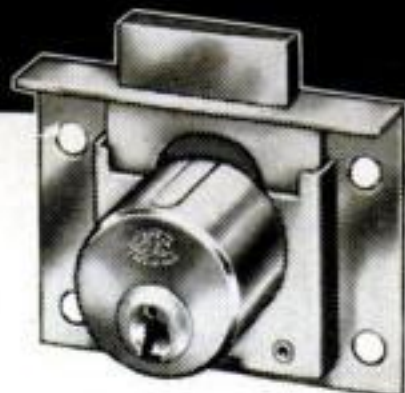
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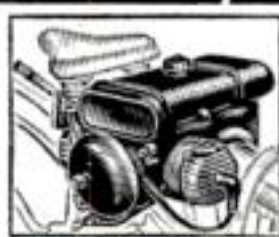
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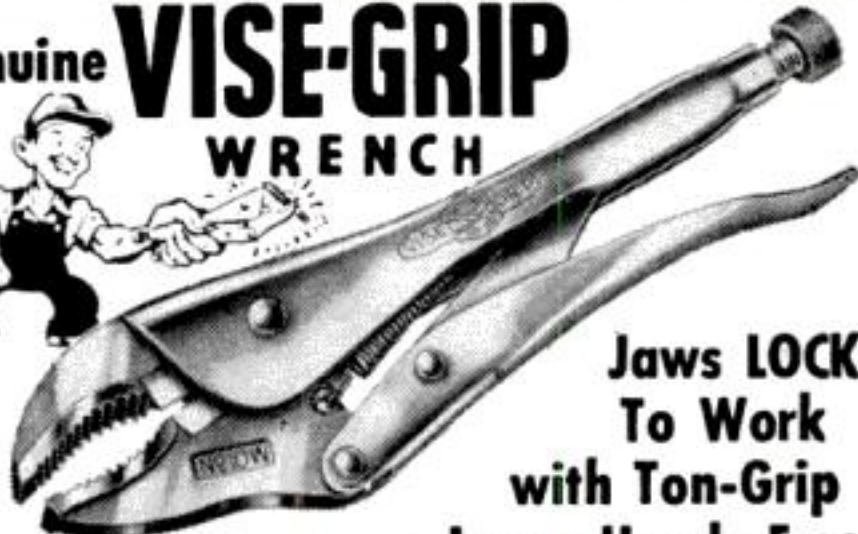
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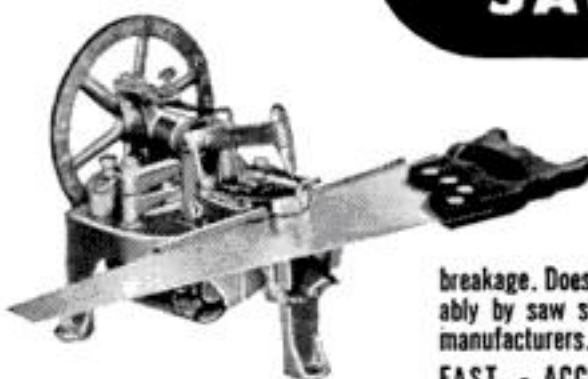
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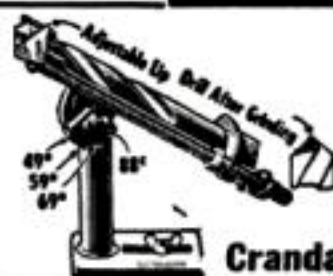
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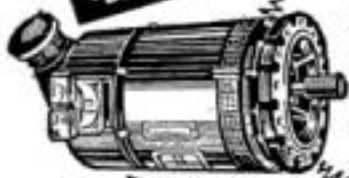
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For WATER, OIL, INSECTICIDES. Also applicable as Automobile Crankcase Drain Pump. Pressures 70 lbs. 12 gal. per minute at 200 R.P.M. Using 3/4 HP as vacuum pump for milking machines, compressors, lab. use, etc. Delivers 26" vacuum, 8 cu. ft. per min. at 1500 RPM using 3/4 HP., rotates either direction. 1/2" pipe thread ports. .650 splined shaft. Data & instructions incl. Stock #27 **\$12.95** post-paid

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With built in 1/4 H.P. MOTOR included. BRAND NEW. COMPLETE. Self Contained, Explosion proof. Ideal for Gasoline, Oils, Water and non-corrosive liquids. Applicable for 24 V. D.C./A.C. or on 110 Volts A.C. The Discharge is for 3/4" hose connection. Capacity 400 G.P.H. For Cottages, Basements, Laboratories, Boats, etc. Instructions incl. \$85.00 value. Stock #659. Only **\$12.95** F.O.B. K.C.

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Stock #429. Double action hydraulic cylinder 1 1/8" Bore, Stroke 1 3/8", Shaft 1/2" dia. including hinged mounting base. Overall length 10" Capacity 1000 lbs. with 1000 P.S.I. **\$5.50** post-paid

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For two double action cylinders allowing operator to raise or lower the both cylinders simultaneously or raise one and lower the other at predetermined rate and speed. \$75.00 value... **\$14.50** post-paid

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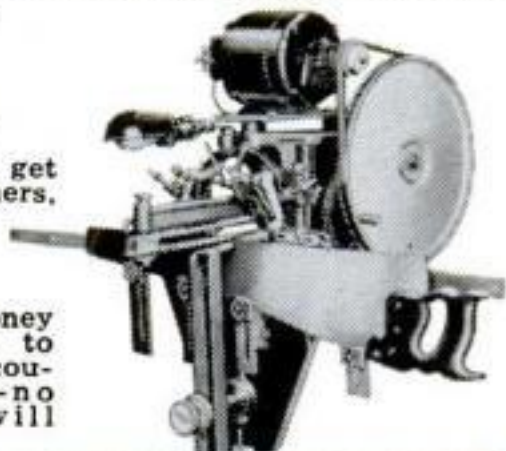
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With built-in variable flow control valve in head. Positive displacement piston type. Displaces .450 cu. in. per revolution. 2 gal. per min. cap. at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous, 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent maximum 4500 RPM. Rotates either direction without adjustment. **1950**

VICKERS HYD. VARIABLE DISPLACEMENT PUMP

Will deliver maximum volume at any pressure setting between 600 & 900 PSI. Desired pressure settings obtained with adjusting screw. Pump housing serves as reservoir for system. Has built-in compressed air supercharger which makes system independent of outside atmospheric pressure. Rotation is left hand only. Maximum speed for continuous duty is 3750 RPM. Displacement is .484 cu. in. per revolution or 3250 approx. 4 GPM at 1750 RPM. **3250**

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1/16" - 4 1/2 ft.	7/32" - 10 1/2 ft.
5/64" - 5 ft.	1/4" - 12 1/2 ft.
3/32" - 5 1/2 ft.	9/32" - 15 ft.
1/8" - 7 ft.	5/16" - 16 1/2 ft.
5/32" - 7 1/2 ft.	3/8" - 18 ft.
3/16" - 9 1/2 ft.	1/2" - 20 ft.

SPECIAL 3/16" cable, 18 feet long, with turnbuckle ends. **99c**

Stainless Steel Cable - Pre-Formed

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The most dependable type voltage regulator used by the Armed Forces. Suitable for use with any 24 to 28 volt generator (see above). Accurately regulates flow of voltage at any setting between 20 and 30 volts. Comes complete with mounting base. **ONLY 675**

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Heavy duty G.E. Gear Head Motor. 1 1/2 H.P., 24 volt D.C., 125 Amp. reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 RPM at 5/8" diameter take-off shaft. Motor contains electro magnetic brake. **1095**

UNIT COMPLETE **1095** MOTOR **495** GEAR BOX ALONE **795**

LEAR GEAR HEAD MOTOR - Lear 24 volt DC, 7.6 amp, series wound reversible motor with overload clutch. Motor turns 11,000 RPM driving thru a 10 to 1 gear reduction box which turns the final take-off shaft 1100 RPM. Adjustable limit switches control limit of travel. Take-off shaft adapts to flex or rigid drives. **1750**

ELECTRIC ACTUATOR

Hundreds of uses for any mechanical device needing controlled 2 way action. Opens, closes, raises or lowers doors... windows, gates, valves. **CTU-2 Foote Linear Actuator.** 24V AC or DC, 8500 RPM, 1/6 HP - series wound motor. 4-1/2" stroke in 13-1/2 seconds. Compression & tension loads up to 750 lbs. Adjustable micro switch for limits of travel. Overall lgh. retracted 11 inches. **795**

EA-E1 - EASTMAN ACTUATOR—Has a 1/8 HP, 24 volt DC, 10,200 RPM motor and push-pull actuator. Actuator has 4" travel through a reduction gear box. Has adjustable limit switches & forward & reversing relays. Overall lgh. extd. 20", retracted 15 1/2". **1295**

FIRE EXTINGUISHER

Kiddie Lux - CO² Type. Built to Gov't specifications. Heavy, shatter-proof case. Recent hydro-static test. Reconditioned and fully charged. LIKE NEW! READY FOR INSTANT USE!!

2 lb. size with Swing Nozzle . . .	13.75
3 1/2 lb. size with Swing Nozzle . . .	17.95
7 1/2 lb. size with Horn	23.75
10 lb. size with New Squeeze Grip Handle & 3/2 ft flex hose with Horn.	29.75
15 lb. size with Squeeze Grip hdl, 4ft. flex hose, plastic horn..	\$42.50
15 lb. size with Wheel Control . . .	37.95

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DC Battles AC to Pull Heavy Loads

[Continued from page 100]

70 loads and 11 empties strung out behind. That's 6,975 tons.

Obviously, General Electric units 4941-4942 are not overloaded on this run. Your Jersey City-bound freight is climbing past the 40-m.p.h. mark before you have rolled three miles. Within another three she is up to 50. You roar past an interlocking tower and fireman Alex Defontes swings a flashlight beam at the dimly lighted window, gets a wigwag in return.

Right now, General Electric engineer Parsons is working his own flashlight over the rumbling, black cab interior. He shows you the massive steel posts that protect the crew down in the semicircular nose section; points out that the bridgelike flanks of the locomotive itself weld the whole unit into a tough steel channel. By adding only five percent to the weight of the outside panels for this purpose, some 40 percent of the heavy floor-frame tonnage of previous electric engines has been lopped off, with no lessening of structural strength.

GE Engine Packs Power to Spare

Under the decks, unseen, but responding smoothly to the slightest change in the controller, are the eight new AC traction motors which are the heart of the GE design. Each develops its 625 horsepower within space limits believed impossible 10 years ago. Each, through the use of silicone insulation instead of ordinary putty and varnish, shrugs off the heavy overloads.

Like Westinghouse, GE has provided electric braking. In both systems the motors are changed into generators to produce a powerful drag on the driving axles. As generators, both types turn out direct current, which naturally could not be fed directly back to the AC trolley wires. So both manufacturers have borrowed a trick used in Diesel locomotives. They simply shoot the juice into resistance grids and blow the heat out through a grille in the roof of the cab.

The GG-1 Is Hard to Beat

This is the AC part of the freight-locomotive story. But it doesn't quite wrap up the case for either manufacturer. Special Duty Engineman Baldwin, who is riding with you as far as Philadelphia, points out that there is a third contender in the ring.

"Back in 1934," he says, "Westinghouse and GE stacked the cards against them-

selves. They cooperated with us on a super passenger engine—the GG-1. Everything about that job was built for speed. Streamlined jacket; AC traction motors; low gear ratio. But she turned out almost too good. A double-forked thunderbolt, you might say. Whips a quarter of a mile of Pullmans over the road at 100 miles an hour. Then she latches onto a freight. Walks away so fast the crew back in the cabin car get nervous. Think they climbed aboard the Congressional by mistake.

"Result: We were sold on the one, all-purpose locomotive design. Got a fleet of 139 of the mighty Gs right now. Believe me, one of these new babies has got to be good to make us change our minds." **END**

Next Month: PSM tells how all trains west of the Rockies may run on hydroelectric power.

New U. S. Liner Challenges Queens

[Continued from page 112]

Behind all these innovations is the genius and drive of a man generally considered the country's No. 1 naval architect. He is William Francis Gibbs of the New York firm of Gibbs & Cox. Designer of the *America*, the country's largest passenger ship now in service, and other major merchant craft as well as many types of naval vessels, he has for many years advocated such a supership as the *United States*—in the top class for speed, completely fireproofed, air-conditioned, luxurious. It took a lot of persuading, over the years. But his dream began to turn to reality on April 7, 1948, when the Government's Maritime Commission and the United States Lines agreed on a financing plan and the Newport News yard was given the word to go ahead with the construction. The original contract price was a little under \$70,000,000; modifications at the behest of the Government have raised that figure considerably.

For its money the nation has a lot of ship to show. In peacetime the *United States* will maintain its North Atlantic express run and few doubt that it will take a shot at the record now held by the *Queen Mary*—3 days 20 hours and 40 minutes, east-bound. All this means prestige and patronage. In wartime the ship, as the nation's largest transport, could carry 14,000 to 16,000 troops as far as 10,000 miles without a stop. Peace or war, a lot of ship. **END**

This One



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★ This Hose Test is convincing proof of why *Marfak* lubrication lasts longer — does a *better* job of protecting your car's chassis. *Marfak* is specially compounded to withstand the "washing action" of rain, road water. That's mighty important this time of year. And bulldog-tough *Marfak* clings to points of wear and friction, resists jar-out, squeeze-out. As a result, *Marfak* lasts for 1,000 miles or more. And *you* enjoy "cushiony" driving that *lasts*! Get *Marfak* lubrication today. See your Texaco Dealer, *the best friend your car ever had*.



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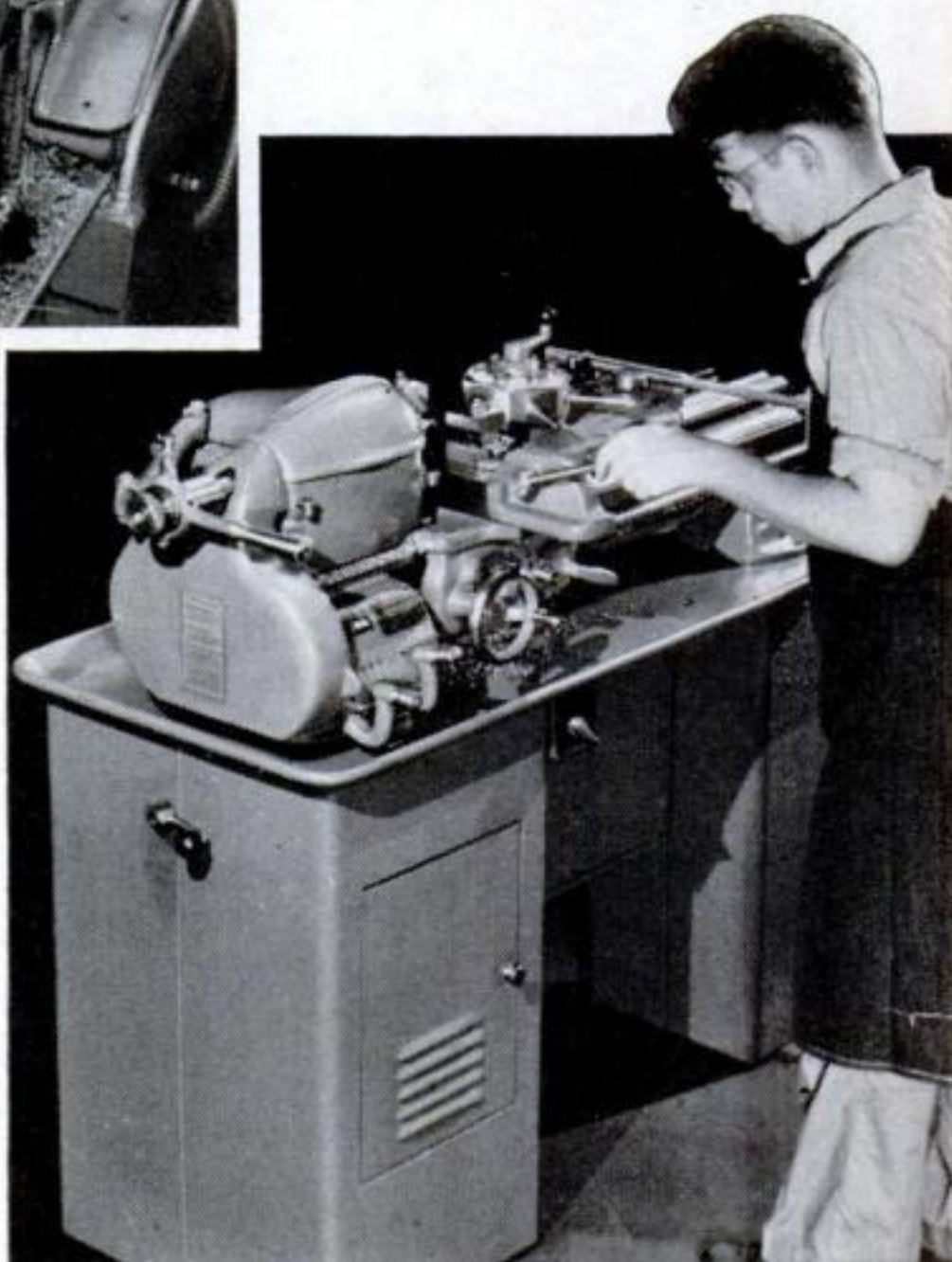


KEEP CLOSE-TOLERANCE MACHINING EFFICIENT!

South Bend PRECISION TURRET LATHES

South Bend 2-H Precision Turret Lathe—1" collet capacity, 16¼" swing, 96 power turret feeds, 48 cross slide feeds, 48 carriage feeds, 48 thread cutting feeds.

South Bend Precision Turret Lathes keep efficient the machining of small duplicate parts. Their remarkable accuracy and positive controls simplify the holding of close tolerances with only normal machine handling care. Finishes are commonly produced that otherwise would require additional operations. Simplicity of tooling makes job changes quick and economical. Wide ranges of power feeds and thread cutting feeds assure maximum efficiency on every job. They are particularly suited for second operations. Available in 3 sizes: 1" collet—16" swing; 1" collet—10" swing; ½" collet—9" swing.



South Bend CL930-Z Precision Turret Lathe—½" collet capacity, 9¼" swing, 48 carriage feeds, 48 thread cutting feeds, handlever cross slide, handlever turret.



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\$15²⁰ an hour!

This is the average earning reported by Presto salesman **WILLIAM F. WYDALLIS**. "The sky's the limit" on Presto profits because of America's serious need for this new fire extinguishing discovery.



WILLIAM F. WYDALLIS

"Most specialty salesmen are always on the lookout for a 'natural.' The 'natural' of this decade is the PRESTO FIRE EXTINGUISHER... because it is handy in size, simple to operate, and in the right price range.

"For every hour I have devoted to the Presto, I find that I have earned an average of \$15.20 an hour. I am now convinced that extraordinary money can be made in this safety field. I am devoting more of my time to this product now since I have discovered that the earnings on this item are greater than any item I have handled in the past."

—William F. Wydallis
Van Wert, Ohio



CHARLES KAMA

This Presto salesman from Texas was featured as "Salesman of the Month" on the front cover of a sales magazine. He told the magazine's reporter:

"I think I've succeeded pretty well. I'm making more than a thousand dollars a month—and I haven't touched bottom yet."

Folks Are Amazed when you Tell Them This New Kind of Protection Costs Only **\$3.98**

WOULDN'T YOU like to be making the kind of money William F. Wydallis is making? His story (printed at right) is just one example of the brilliant success that Presto salesmen are meeting everywhere! A Florida salesman earned \$600 in one month. An Ohio man earned \$2100 in 2 months. A New York salesman earned \$1500 in one month. A New Hampshire salesman added the Presto as a *sideline* and picked up an extra \$1800 in 20 months.

What is the Secret?

PRESTO contains an amazing new chemical "Chlorobromomethane" or "C.B." developed as a secret defense against fire during the war.

In comparing the effectiveness of "C.B." in fighting various kinds of fires an authoritative testing laboratory states: "It has been proved that 'C.B.' is about 1.5 to 6 times as effective as other common extinguishing agents on an equal weight basis."

This extra effectiveness of "C.B." means that Presto can be made light and handy enough for even a woman or child to use. Just a twist of the knob . . . and flames disappear! "Sells on sight" to civil defense workers, owners of homes, cars, stores, farms, service stations, boats, motorcycles, factories, offices and to stores for re-sale.

Why Large Presto Profits Are So Easy

Everyone is terrified at the very thought of **FIRE!** Every year fire kills more than 11,000 people. Most people who see Presto in action want one or more — **ESPECIALLY WHEN THE PRICE IS ONLY \$3.98 EACH!**

You can demonstrate Presto in a few minutes, and every sale will net you \$1 or more. We refill your demonstrator free . . . and we give you dramatically powerful printed sales material to "talk from" . . . free certificates testifying that Presto is **GUARANTEED FOR 20 YEARS.**

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YOU DON'T NEED TO INVEST A PENNY. Just collect and keep \$1 or more every time you write an order—we collect the balance and deliver the extinguisher. (Or if you wish, you can buy from us at extra-low wholesale prices and then make up to \$2.18 profit per unit supplying both dealers and retail customers—we'll send you free details.)

Start Now—Mail Coupon

Get started in this rich new field now. Don't "put it off"! Every day you hesitate may cost you \$10, \$15, or even \$50 you could otherwise be making. Mail the coupon at right **NOW** for everything you need to get started right away!

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Best Selling Months Just Ahead! Don't Delay—Mail Coupon Now!

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Please send me illustrated sales literature, liberal profit plan, order blanks—everything I need to get started making good money introducing the Presto Fire Extinguisher in my locality.

☐ **CHECK HERE IF YOU WISH TO ORDER A REGULAR PRESTO TO BE USED AS A DEMONSTRATOR (\$2.50).** Pays for itself many times over in increased sales. Can be returned as often as you like for **FREE** re-fill. You needn't enclose any money now—we'll send Demonstrator C.O.D. (Or if you wish to save money, enclose \$2.50 and we'll pay postage.)

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- ➡ Automatic Pressure — No Pumping
- ➡ Guaranteed for 20 Years — Certificate is Packed with Every Presto



These baseball stars pick **Camels**

FOR FLAVOR
FOR MILDNESS



Ed Lopat Yankee 21-game winner has tried different cigarettes. Says Ed, "I picked Camels for mildness and flavor. No other cigarette gives me so much smoking pleasure!"



Early Wynn 20-game winner for the Indians is a Camel smoker, too. Early reports: "For steady smoking, my choice is Camels! They're mild and they taste great!"



Allie Reynolds Yankee pitcher of double "no-hit" fame. Allie stated, "I've smoked Camels a long time and I know how mild a cigarette can be! Camels taste great!"



"Preacher" Roe (22-3 in 1951) and other Dodgers—Carl Furillo, Clem Labine, Clyde King and Billy Cox—are Camel smokers. "We all agree on Camel mildness," says "Preach."



TEST FOR **MILDNESS**...TEST FOR **FLAVOR**...SEE WHY

**CAMEL IS AMERICA'S
MOST POPULAR CIGARETTE
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Smoke Camels for 30 straight days. See how flavorful Camels are, pack after pack... See how mild Camels are, how well they agree with your throat as your steady smoke. You'll know why Camel is by far America's most popular cigarette!

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*Make your own sensible 30-Day
Camel Mildness test in your "T-Zone"*
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